

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - Diagnostic Code Index - Gladiator [EXJ]

DIAGNOSTIC CODE INDEX

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DTC	Description
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DTC	Description
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DTC	Description
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<u>P0675-00</u>	CYLINDER 5 GLOW PLUG CIRCUIT OPEN
<u>P0676-00</u>	CYLINDER 6 GLOW PLUG CIRCUIT OPEN
<u>P067A-00</u>	CYLINDER 4 GLOW PLUG CIRCUIT LOW
<u>P067B-00</u>	CYLINDER 4 GLOW PLUG CIRCUIT HIGH
<u>P067C-00</u>	CYLINDER 5 GLOW PLUG CIRCUIT LOW
<u>P067D-00</u>	CYLINDER 5 GLOW PLUG CIRCUIT HIGH
<u>P067E-00</u>	CYLINDER 6 GLOW PLUG CIRCUIT LOW
<u>P067F-00</u>	CYLINDER 6 GLOW PLUG CIRCUIT HIGH
<u>P0683-00</u>	GLOW PLUG CONTROL MODULE 1 TO PCM COMMUNICATION CIRCUIT
<u>P068A-00</u>	PCM POWER DE-ENERGIZED PERFORMANCE - TOO EARLY
<u>P068B-00</u>	ECM POWER DE-ENERGIZED PERFORMANCE - TOO LATE
<u>P0691-00</u>	COOLING FAN 1 CONTROL CIRCUIT LOW
<u>P0692-00</u>	COOLING FAN 1 CONTROL CIRCUIT HIGH
<u>P0697-00</u>	SENSOR REFERENCE VOLTAGE 3 CIRCUIT
<u>P06A0-00</u>	VARIABLE AC COMPRESSOR CONTROL CIRCUIT
<u>P06B9-00</u>	CYLINDER 1 GLOW PLUG CIRCUIT PERFORMANCE

DTC	Description
<u>P06BA-00</u>	CYLINDER 2 GLOW PLUG CIRCUIT PERFORMANCE
<u>P06BB-00</u>	CYLINDER 3 GLOW PLUG CIRCUIT PERFORMANCE
<u>P06BC-00</u>	CYLINDER 4 GLOW PLUG CIRCUIT PERFORMANCE
<u>P06BD-00</u>	CYLINDER 5 GLOW PLUG CIRCUIT PERFORMANCE
<u>P06BE-00</u>	CYLINDER 6 GLOW PLUG CIRCUIT PERFORMANCE
<u>P06EA-00</u>	NOX SENSOR 1/1 PROCESSOR PERFORMANCE
<u>P06EB-00</u>	NOX SENSOR 1/2 PROCESSOR PERFORMANCE
<u>P06FE-00</u>	COLD START DIESEL INTAKE AIR FLOW CONTROL PERFORMANCE
<u>P07FF-00</u>	COLD START TRANSMISSION PERFORMANCE
<u>P0A1A-00</u>	GENERATOR CONTROL MODULE
<u>P1139-00</u>	DRIVE SWITCH 2 CIRCUIT HIGH
<u>P1220-00</u>	EXCESSIVE CYCLING OF REDUCTANT LINE AIR PURGING CONTROL
<u>P1221-00</u>	EXCESSIVE CYCLING OF REDUCTANT PUMP INLET DEFROSTING
<u>P1222-00</u>	EXCESSIVE CYCLING OF REDUCTANT PUMP OUTLET DEFROSTING
<u>P1286-00</u>	NOX SENSOR 1/1 ZERO OFFSET TOO HIGH
<u>P1287-00</u>	NOX SENSOR 1/1 ZERO OFFSET TOO LOW
<u>P1288-00</u>	NOX SENSOR 1/2 ZERO OFFSET TOO HIGH
<u>P1289-00</u>	NOX SENSOR 1/2 ZERO OFFSET TOO LOW
<u>P1290-00</u>	COLD START FUEL PRESSURE TOO HIGH BANK 1
<u>P1292-00</u>	COLD START FUEL PRESSURE TOO LOW BANK 1
<u>P1296-00</u>	EGR SLOW RESPONSE - INCREASING FLOW
<u>P1297-00</u>	EGR SLOW RESPONSE - DECREASING FLOW
<u>P1500-00</u>	ECU CONFIGURATION MISMATCH
<u>P152E-00</u>	ENGINE HOOD SWITCH 2 CIRCUIT HIGH
<u>P152F-00</u>	ENGINE HOOD SWITCH 2 / ENGINE HOOD SWITCH 1 CORRELATION
<u>P1660-00</u>	EMERGENCY STOP FUEL SHUT-OFF SOLENOID
<u>P1686-00</u>	EGR ACTUATOR CONTROL CIRCUIT LOW - POSITIVE SIDE
<u>P1688-00</u>	EGR ACTUATOR CONTROL CIRCUIT HIGH - POSITIVE SIDE
<u>P1689-00</u>	EGR ACTUATOR CONTROL CIRCUIT LOW - NEGATIVE SIDE
<u>P168A-00</u>	EGR ACTUATOR CONTROL CIRCUIT HIGH - NEGATIVE SIDE
<u>P1690-00</u>	REDUCTANT INJECTION VALVE CIRCUIT LOW - POSITIVE SIDE
<u>P1691-00</u>	REDUCTANT INJECTION VALVE CIRCUIT HIGH - POSITIVE SIDE
<u>P1692-00</u>	REDUCTANT INJECTION VALVE CIRCUIT LOW - NEGATIVE SIDE
<u>P1693-00</u>	REDUCTANT INJECTION VALVE CIRCUIT HIGH - NEGATIVE SIDE
<u>P1732-00</u>	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW - POSITIVE SIDE
<u>P1733-00</u>	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH - POSITIVE SIDE
<u>P1734-00</u>	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW - NEGATIVE SIDE
<u>P1735-00</u>	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH - NEGATIVE SIDE
<u>P1D30-00</u>	OIL VISCOSITY TOO LOW
<u>P1D49-00</u>	INTERNAL CONTROL MODULE POST INJECTION 2 SHUT OFF ERROR
<u>P1D73-00</u>	AGS PERFORMANCE
<u>P1E0C-00</u>	EMPTY FUEL TANK
<u>P2002-00</u>	DIESEL PARTICULATE FILTER EFFICIENCY BELOW THRESHOLD
<u>P2008</u>	INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT OPEN - BANK

DTC	Description
<u>P2009-00</u>	INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT LOW - BANK 1
<u>P200A-00</u>	INTAKE MANIFOLD RUNNER PERFORMANCE - BANK 1
<u>P200B-00</u>	INTAKE MANIFOLD RUNNER PERFORMANCE - BANK 2
<u>P2010-00</u>	INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT HIGH - BANK 1
<u>P2016-00</u>	INTAKE MANIFOLD RUNNER (SWIRL) POSITION SENSOR CIRCUIT LOW - BANK 1
<u>P2017-00</u>	INTAKE MANIFOLD RUNNER (SWIRL) POSITION SENSOR CIRCUIT HIGH - BANK1
<u>P2021-00</u>	INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW BANK 2
<u>P2022-00</u>	INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH BANK 2
<u>P202E-00</u>	REDUCTANT INJECTION VALVE CIRCUIT PERFORMANCE
<u>P2031-00</u>	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT-BANK 1 SENSOR 2
<u>P2032-00</u>	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1 SENSOR 2
<u>P2033</u>	00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH - BANK 1 SENSOR 2
<u>P203A-00</u>	REDUCTANT LEVEL SENSOR CIRCUIT
<u>P203B-00</u>	REDUCTANT LEVEL SENSOR 1 CIRCUIT PERFORMANCE
<u>P203C-00</u>	REDUCTANT LEVEL SENSOR "A" CIRCUIT LOW
<u>P203D-00</u>	REDUCTANT LEVEL SENSOR "A" CIRCUIT HIGH
<u>P203E-00</u>	REDUCTANT LEVEL SENSOR 1 CIRCUIT INTERMITTENT/ERRATIC
<u>P203F-00</u>	REDUCTANT LEVEL TOO LOW
<u>P2043-00</u>	REDUCTANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE
<u>P2047-00</u>	REDUCTANT INJECTOR 1/1 CIRCUIT
<u>P204F-00</u>	REDUCTANT SYSTEM PERFORMANCE
<u>P206A-00</u>	REDUCTANT QUALITY SENSOR CIRCUIT
<u>P206B-00</u>	REDUCTANT QUALITY SENSOR CIRCUIT PERFORMANCE
<u>P206D-00</u>	REDUCTANT QUALITY SENSOR CIRCUIT HIGH
<u>P2080</u>	00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE
<u>P2084</u>	00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE - BANK 1 SENSOR 2
<u>P208A-00</u>	REDUCTANT PUMP -A- CONTROL CIRCUIT OPEN
<u>P208B</u>	00-REDUCTANT PUMP 1 CONTROL PERFORMANCE
<u>P208C</u>	00-REDUCTANT PUMP -A- CONTROL CIRCUIT LOW
<u>P208D-00</u>	REDUCTANT PUMP -A- CONTROL CIRCUIT HIGH
<u>P20B9-00</u>	REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT OPEN
<u>P20BA</u>	00-REDUCTANT HEATER 1 CONTROL CIRCUIT PERFORMANCE
<u>P20BB</u>	00-REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT LOW
<u>P20BC</u>	00-REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT HIGH
<u>P20BD</u>	00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT/OPEN
<u>P20BE</u>	00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT PERFORMANCE
<u>P20BF</u>	00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT LOW
<u>P20C0</u>	00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT HIGH
<u>P20C2-00</u>	REDUCTANT HEATER 3 CONTROL CIRCUIT PERFORMANCE
<u>P20C6-00</u>	REDUCTANT HEATER 4 CONTROL CIRCUIT PERFORMANCE
<u>P20E8</u>	00-REDUCTANT PRESSURE TOO LOW

DTC	Description
<u>P20E9</u>	00-REDUCTANT PRESSURE TOO HIGH
<u>P20EE</u>	00-SCR NOX CATALYST EFFICIENCY BELOW THRESHOLD BANK 1
<u>P20F4</u>	00-REDUCTANT CONSUMPTION TOO LOW
<u>P20F5</u>	00-REDUCTANT CONSUMPTION TOO HIGH
<u>P20FA</u>	00-REDUCTANT PUMP 2 CONTROL CIRCUIT/OPEN
<u>P20FB</u>	00-REDUCTANT PUMP 2 CONTROL PERFORMANCE
<u>P20FC</u>	00-REDUCTANT PUMP 2 CONTROL CIRCUIT LOW
<u>P20FD</u>	00-REDUCTANT PUMP 2 CONTROL CIRCUIT HIGH
<u>P2122-00</u>	ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW
<u>P2123-00</u>	ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH
<u>P2127-00</u>	ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW
<u>P2128-00</u>	ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH
<u>P2138</u>	00-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION
<u>P214F-00</u>	REDUCTANT HEATER 1 CURRENT TOO HIGH
<u>P2195</u>	00-O2 SENSOR 1/1 STUCK LEAN
<u>P2196</u>	00-O2 SENSOR 1/1 STUCK RICH
<u>P2199</u>	00-INTAKE AIR TEMPERATURE SENSOR 1 / 2 CORRELATION
<u>P21C5</u>	00-REDUCTANT LEVEL SENSOR 1 STUCK
<u>P21C7-00</u>	REDUCTANT CONTROL MODULE POWER RELAY-RELAYS CONTROL CIRCUIT-OPEN
<u>P21DD-00</u>	REDUCTANT HEATER 1 CURRENT TOO LOW
<u>P2200</u>	00-NOX SENSOR 1 CIRCUIT
<u>P2201</u>	00-NOX SENSOR 1 CIRCUIT PERFORMANCE
<u>P2202</u>	00-NOX SENSOR 1 CIRCUIT LOW
<u>P2203</u>	00-NOX SENSOR 1 CIRCUIT HIGH
<u>P2209</u>	00-NOX SENSOR 1 HEATER SENSE CIRCUIT PERFORMANCE
<u>P220A</u>	00-NOX SENSOR BANK 1 SENSOR 1 SUPPLY VOLTAGE CIRCUIT
<u>P220B</u>	00-NOX SENSOR BANK 1 SENSOR 2 SUPPLY VOLTAGE CIRCUIT
<u>P220E-00</u>	NOX SENSOR HEATER 1/1 CONTROL CIRCUIT RANGE/PERFORMANCE
<u>P220F-00</u>	NOX SENSOR HEATER 1/2 CONTROL CIRCUIT RANGE/PERFORMANCE
<u>P221C-00</u>	REDUCTANT HEATER B CURRENT TOO LOW
<u>P221D-00</u>	REDUCTANT HEATER B CURRENT TOO HIGH
<u>P2227-00</u>	BAROMETRIC PRESSURE CIRCUIT PERFORMANCE
<u>P2228-00</u>	BAROMETRIC PRESSURE SENSOR CIRCUIT LOW
<u>P2229-00</u>	BAROMETRIC PRESSURE SENSOR CIRCUIT HIGH
<u>P2237-00</u>	O2 SENSOR 1/1 PUMP CELL CURRENT CIRCUIT OPEN
<u>P2243-00</u>	O2 SENSOR 1/1 REFERENCE VOLTAGE CIRCUIT/OPEN
<u>P224A-00</u>	NOX SENSOR HEATER RESISTANCE (BANK 1 SENSOR 1)
<u>P224B-00</u>	NOX SENSOR HEATER RESISTANCE (BANK 1 SENSOR 2)
<u>P2251-00</u>	O2 SENSOR 1/1 NEGATIVE CURRENT CONTROL CIRCUIT/OPEN
<u>P225C-00</u>	NOX SENSOR 1/1 PERFORMANCE - SIGNAL STUCK HIGH
<u>P225D-00</u>	NOX SENSOR 1/1 PERFORMANCE - SIGNAL STUCK LOW
<u>P2266-00</u>	WATER IN FUEL (WIF) SENSOR VOLTAGE TOO LOW
<u>P2269-00</u>	WATER IN FUEL CONDITION
<u>P226C-00</u>	TURBOCHARGER BOOST CONTROL "A" SLOW RESPONSE
<u>P2279-00</u>	INTAKE AIR SYSTEM LEAK
<u>P2280-00</u>	AIR FLOW RESTRICTION
<u>P2297-00</u>	O2 SENSOR 1/1 OUT OF RANGE DURING DECELERATION

DTC	Description
<u>P2299-00</u>	BRAKE PEDAL POSITION/ACCELERATOR PEDAL POSITION INCOMPATIBLE
<u>P229E-00</u>	NOX SENSOR CIRCUIT - BANK 1 SENSOR 2
<u>P229F-00</u>	NOX SENSOR CIRCUIT RANGE/PERFORMANCE BANK 1 SENSOR 2
<u>P22A0-00</u>	NOX SENSOR 1/2 CIRCUIT LOW
<u>P22A1-00</u>	NOX SENSOR CIRCUIT HIGH - BANK 1 SENSOR 2
<u>P22A7-00</u>	NOX SENSOR HEATER SENSE CIRCUIT RANGE/PERFORMANCE - BANK 1
<u>P22FA-00</u>	NOX SENSOR PERFORMANCE - SLOW RESPONSE HIGH TO LOW BANK 1 SENSOR 1
<u>P232A-00</u>	TCM REQUEST-FORCED ENGINE SHUTDOWN
<u>P240F-00</u>	EGR SLOW RESPONSE
<u>P2413-00</u>	EGR SYSTEM PERFORMANCE
<u>P241D-00</u>	SCR INDUCEMENT - FORCED ENGINE SHUTDOWN
<u>P241F-00</u>	EGR COOLER B EFFICIENCY BELOW THRESHOLD
<u>P242B-00</u>	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE - BANK1 SENSOR 3
<u>P242C-00</u>	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK1 SENSOR 3
<u>P242D-00</u>	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH - BANK1 SENSOR 3
<u>P244A-00</u>	DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE TOO LOW
<u>P2453-00</u>	DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT PERFORMANCE
<u>P2454-00</u>	DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT LOW
<u>P2455-00</u>	DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT HIGH
<u>P2457-00</u>	EXHAUST GAS RECIRCULATION COOLING SYSTEM PERFORMANCE
<u>P2459-00</u>	DIESEL PARTICULATE FILTER REGENERATION FREQUENCY
<u>P245A-00</u>	EGR COOLER BYPASS CONTROL CIRCUIT OPEN
<u>P245B-00</u>	EGR-COOLER-BYPASS-CONTROL-CIRCUIT-PERFORMANCE
<u>P245C-00</u>	EGR COOLER BYPASS CONTROL CIRCUIT LOW
<u>P245D-00</u>	EGR COOLER BYPASS CONTROL CIRCUIT HIGH
<u>P2463</u>	PARTICULATE FILTER RESTRICTION - SOOT ACCUMULATION BANK 1
<u>P246F-00</u>	EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT PERFORMANCE
<u>P2470-00</u>	EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT LOW
<u>P2471-00</u>	EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT HIGH
<u>P249C-00</u>	EXCESSIVE TIME TO ENTER CLOSED LOOP REDUCTANT INJECTION CONTROL
<u>P249D-00</u>	CLOSED LOOP REDUCTANT INJECTION CONTROL AT LIMIT - FLOW TOO LOW
<u>P249E-00</u>	CLOSED LOOP REDUCTANT INJECTION CONTROL AT LIMIT - FLOW TOO HIGH
<u>P249F-00</u>	EXCESSIVE TIME TO ENTER CLOSED LOOP DPF REGENERATION CONTROL
<u>P24A0-00</u>	CLOSED LOOP DPF REGENERATION CONTROL AT LIMIT - TEMPERATURE TOO LOW
<u>P24A1-00</u>	CLOSED LOOP DPF REGENERATION CONTROL AT LIMIT - TEMPERATURE TOO HIGH
<u>P24A4-00</u>	PARTICULATE FILTER RESTRICTION - SOOT ACCUMULATION TOO HIGH

DTC	Description
<u>P24AE-00</u>	PARTICULATE MATTER SENSOR CIRCUIT
<u>P24AF-00</u>	PARTICULATE MATTER SENSOR CIRCUIT PERFORMANCE
<u>P24B1-00</u>	PARTICULATE MATTER SENSOR CIRCUIT HIGH
<u>P24B3-00</u>	PARTICULATE MATTER SENSOR HEATER CONTROL CIRCUIT OPEN
<u>P24B6-00</u>	PARTICULATE MATTER SENSOR HEATER CONTROL CIRCUIT HIGH
<u>P24B7-00</u>	PARTICULATE MATTER SENSOR HEATER RESISTANCE
<u>P24C2-00</u>	EXHAUST GAS TEMPERATURE MEASUREMENT SYSTEM - MULTIPLE SENSOR CORRELATION BANK 1
<u>P24C6-00</u>	PARTICULATE MATTER SENSOR TEMPERATURE CIRCUIT
<u>P24C7-00</u>	PARTICULATE MATTER SENSOR TEMPERATURE CIRCUIT PERFORMANCE
<u>P24D0-00</u>	PARTICULATE MATTER SENSOR SUPPLY VOLTAGE CIRCUIT LOW
<u>P24D1-00</u>	PARTICULATE MATTER SENSOR REGENERATION INCOMPLETE
<u>P24DA-00</u>	PARTICULATE MATTER SENSOR EXHAUST SAMPLE ERROR BANK 1
<u>P24F2-00</u>	EGR TEMPERATURE/CHARGE AIR COOLER TEMPERATURE CORRELATION
<u>P24F3-00</u>	REDUCTANT TANK TEMPERATURE/FUEL TEMPERATURE CORRELATION
<u>P2505-00</u>	ECM-PCM POWER INPUT SIGNAL
<u>P2564-00</u>	TURBOCHARGER POSITION SENSOR CIRCUIT LOW
<u>P2565-00</u>	TURBOCHARGER POSITION SENSOR CIRCUIT HIGH
<u>P257D-00</u>	ENGINE HOOD SWITCH 1 CIRCUIT PERFORMANCE
<u>P257E-00</u>	ENGINE HOOD SWITCH CIRCUIT LOW
<u>P257F-00</u>	ENGINE HOOD SWITCH 1 CIRCUIT HIGH
<u>P258A-00</u>	ELECTRIC VACUUM PUMP CIRCUIT
<u>P258B-00</u>	ELECTRIC VACUUM PUMP PERFORMANCE
<u>P258C-00</u>	VACUUM PUMP CONTROL CIRCUIT LOW
<u>P258D-00</u>	VACUUM PUMP CONTROL CIRCUIT HIGH
<u>P259C-00</u>	EXCESSIVE TIME TO ENTER CLOSED LOOP TURBOCHARGER 1 BOOST CONTROL
<u>P2610-00</u>	PCM INTERNAL ENGINE OFF TIMER PERFORMANCE
<u>P2635-00</u>	FUEL PUMP 1 LOW FLOW-PERFORMANCE
<u>P2681-00</u>	ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT OPEN
<u>P2682-00</u>	ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT LOW
<u>P2683-00</u>	ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT HIGH
<u>P268C-00</u>	CYLINDER 1 INJECTOR DATA INCOMPATIBLE
<u>P268D-00</u>	CYLINDER 2 INJECTOR DATA INCOMPATIBLE
<u>P268E-00</u>	CYLINDER 3 INJECTOR DATA INCOMPATIBLE
<u>P268F-00</u>	CYLINDER 4 INJECTOR DATA INCOMPATIBLE
<u>P2690-00</u>	CYLINDER 5 INJECTOR DATA INCOMPATIBLE
<u>P2691-00</u>	CYLINDER 6 INJECTOR DATA INCOMPATIBLE
<u>P26A3-00</u>	ENGINE COOLANT BYPASS VALVE 1 PERFORMANCE
<u>P26A6-00</u>	ENGINE COOLANT BYPASS VALVE 1 POSITION SENSOR CIRCUIT LOW
<u>P26A7-00</u>	ENGINE COOLANT BYPASS VALVE 1 POSITION SENSOR CIRCUIT HIGH
<u>P26AB-00</u>	ENGINE COOLANT BYPASS VALVE 1 STUCK
<u>P26E4-00</u>	STARTER CONTROL 2 CIRCUIT
<u>P26E5-00</u>	STARTER CONTROL 2 CIRCUIT LOW
<u>P26E6-00</u>	STARTER CONTROL 2 CIRCUIT HIGH
<u>P26FB-00</u>	EGR COOLER BYPASS CONTROL STUCK CLOSED BANK 1
<u>P26F3-00</u>	STARTER RELAY 2 STUCK OFF

DTC	Description
<u>P2A00-00</u>	O2 SENSOR 1/1 CIRCUIT PERFORMANCE
<u>P2BA9-00</u>	NOX EXCEEDENCE - INSUFFICIENT REDUCTANT QUALITY
<u>P2B99-00</u>	EXHAUST PRESSURE CONTROL VALVE A DRIVER CURRENT/TEMPERATURE TOO HIGH
<u>P2D2D-00</u>	COLD START INTAKE MANIFOLD RUNNER PERFORMANCE BANK 1
<u>P2D2E-00</u>	COLD START INTAKE MANIFOLD RUNNER PERFORMANCE BANK 2
<u>P2D2F-00</u>	TURBOCHARGER-SUPERCHARGER -A- UNDERBOOST CONDITION
<u>P2D30-00</u>	COLD START TURBOCHARGER-SUPERCHARGER -A- OVERBOOST
<u>U0001-00</u>	CAN C BUS
<u>U0074-00</u>	DEDICATED POWERTRAIN-DPT-CAN BUS OFF
<u>U0101-00</u>	LOST COMMUNICATION WITH TCM
<u>U0102-00</u>	LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD
<u>U0103-00</u>	LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE
<u>U0104-00</u>	LOST COMMUNICATION WITH CRUISE CONTROL MODULE
<u>U0106-00</u>	LOST COMMUNICATION WITH GLOW PLUG CONTROL MODULE
<u>U010C-00</u>	LOST COMMUNICATION WITH TURBOCHARGER CONTROL MODULE
<u>U0120-00</u>	LOST COMMUNICATION WITH STARTER/GENERATOR CONTROL MODULE
<u>U0121-00</u>	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
<u>U0140-00</u>	LOST COMMUNICATION WITH BODY CONTROL MODULE
<u>U0151-00</u>	LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)
<u>U0155-00</u>	LOST COMMUNICATION WITH CLUSTER-CCN
<u>U0164-00</u>	LOST COMMUNICATION WITH HVAC CONTROL MODULE
<u>U01B0-00</u>	LOST COMMUNICATION WITH BATTERY MONITOR MODULE
<u>U0229-00</u>	LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE
<u>U0284-00</u>	LOST COMMUNICATION WITH ACTIVE GRILL SHUTTER MODULE 1
<u>U029D-00</u>	LOST COMMUNICATION WITH NOX SENSOR MODULE "A"
<u>U029E-00</u>	LOST COMMUNICATION WITH NOX SENSOR MODULE "B"
<u>U02A2-00</u>	LOST COMMUNICATION WITH REDUCTANT QUALITY MODULE
<u>U02A5-00</u>	LOST COMMUNICATION WITH REDUCTANT HEATER CONTROL MODULE
<u>U0402-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TCM
<u>U0403-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TCASE
<u>U0405-00</u>	IMPLAUSIBLE DATA RECEIVED FROM CRUISE CONTROL MODULE
<u>U0407-00</u>	IMPLAUSIBLE DATA RECEIVED FROM GLOW PLUG CONTROL MODULE
<u>U040D-00</u>	IMPLAUSIBLE DATA RECEIVED FROM TURBOCHARGER/SUPERCHARGER CONTROL MODULE
<u>U0415-00</u>	IMPLAUSIBLE DATA RECEIVED FROM ABS
<u>U0418</u>	IMPLAUSIBLE DATA RECEIVED FROM BRAKE SYSTEM CONTROL MODULE 1
<u>U0420-00</u>	INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE A
<u>U0421-00</u>	IMPLAUSIBLE DATA RECEIVED FROM SUSPENSION CONTROL MODULE
<u>U0422-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
<u>U0423-00</u>	IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN
<u>U0429-00</u>	IMPLAUSIBLE DATA RECEIVED FROM SCM
<u>U0452-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE

DTC	Description
<u>U04A4-00</u>	IMPLAUSIBLE DATA RECEIVED FROM PM SENSOR
<u>U04B1-00</u>	IMPLAUSIBLE DATA RECEIVED FROM BATTERY MONITOR MODULE
<u>U059E-00</u>	IMPLAUSIBLE DATA RECEIVED NOX SENSOR MODULE 1
<u>U059F-00</u>	IMPLAUSIBLE DATA RECEIVED NOX SENSOR MODULE 2
<u>U05A3-00</u>	INVALID DATA RECEIVED FROM REDUCTANT QUALITY MODULE
<u>U05A4-00</u>	PM SENSOR RECEIVED IMPLAUSIBLE DATA FROM PCM
<u>U05A6-00</u>	IMPLAUSIBLE DATA RECEIVED FROM REDUCTANT HEATER CONTROL MODULE
<u>U060F-00</u>	LOST COMMUNICATION WITH MASS OR VOLUME AIR FLOW SENSOR A
<u>U1008-00</u>	LIN 1 BUS
<u>U1009-00</u>	LIN 2 BUS
<u>U1121-00</u>	LOST COMMUNICATION WITH LIN ECU 1
<u>U11A3-00</u>	LOST BRAKE PRESSURE SENSOR 1 MESSAGE
<u>U11A4-00</u>	LOST BRAKE PRESSURE SENSOR 2 MESSAGE
<u>U11B9-00</u>	LOST COMMUNICATION WITH RF HUB
<u>U11BF-00</u>	LOST BRAKE PEDAL POSITION MESSAGE
<u>U11DE</u>	LOST SPEED CONTROL MESSAGE
<u>U120C-00</u>	LOST BRAKE BOOSTER SIGNAL
<u>U12A3-00</u>	LOST COMMUNICATION WITH PM SENSOR
<u>U12A8-00</u>	LOST COMMUNICATION WITH MASTER CYLINDER PRESSURE SENSOR
<u>U1431-00</u>	IMPLAUSIBLE ACC TORQUE MESSAGE RECEIVED
<u>U1432-00</u>	IMPLAUSIBLE CABIN TEMPERATURE SIGNAL RECEIVED
<u>U144F-00</u>	ACTIVE GRILL SHUTTER MODULE 1 RECEIVED IMPLAUSIBLE DATA FROM PCM
<u>U1489-00</u>	IMPLAUSIBLE DATA RECEIVED FROM RF HUB
<u>U3017-00</u>	CONTROL MODULE TIMER-CLOCK PERFORMANCE

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS C0505-00 To P0122-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

C0505-00-LEFT FRONT WHEEL SPEED SENSOR "A" CORRELATION

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCS.
- Vehicle speed.

SET CONDITION

- Anti-lock Brake System (ABS) Module detects a wheel speed signal is 0 km/h (0 mph) or very low when compared to the other wheel speed signals.

DEFAULT ACTION

- Malfunction Indicator Light (MIL) illuminated.
- Anti-lock Brake System (ABS) indicator light illuminated.
- Electronic Stability Control (ESC) System indicator light illuminated.
- ABS disabled.
- ESC disabled.

POSSIBLE CAUSES

Possible Causes
WHEEL SPEED SENSOR (WSS) RELATED DTCS
WHEEL SPEED SENSOR (WSS) FOR LOOSENESS OR MECHANICAL DAMAGE
CONNECTOR/TERMINAL DAMAGE
WHEEL SPEED SENSOR (WSS)
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER WHEEL SPEED SENSOR (WSS) DTCS

1. Refer to the recorded DTCs.

Are there any other WSS DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE WHEEL SPEED SENSOR (WSS) SIGNALS

1. Turn the ignition on.
2. With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If the graph shows periodic dropouts pay close attention to the tone wheel.

3. Slowly accelerate as straight as possible from a stop to 40 km/h (25 mph).

Is the Left Front WSS speed showing 0 km/h (0 mph), or not matching other wheels, or showing erratic behavior?

Yes

- Go To [4](#)

No

- Perform the ABS-INTERMITTENT CONDITION TEST. Refer to [ABS INTERMITTENT CONDITION](#).

4. CHECK THE WSS FOR LOOSENESS/DEBRIS AND INSPECT HARNESS/CONNECTORS/TERMINALS FOR DAMAGE

1. Turn the ignition off.

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

2. Check the WSS for looseness/debris, excessive corrosion and not properly fastened.
3. Visually inspect all the WSS connectors, harnesses for damage.

4. Visually inspect all the WSS for proper mounting or damage.

Where any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE WHEEL SPEED SENSOR (WSS) AND TEST FOR DTCS

1. Replace the Wheel Speed Sensor (WSS) in accordance with the Service Information. Refer to **SENSOR, WHEEL SPEED, FRONT, REMOVAL AND INSTALLATION** .
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

3. Road test the vehicle over 40 km/h (25 mph).

NOTE: Vehicle must be driven for several minutes above 40 km/h (25 mph) for set conditions to be meet.

4. With the scan tool, read PCM DTCS.

Does the DTC remain active?

Yes

- Go To [6](#)

No

- Test complete.

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS Module harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS Module harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS DTCs.

Did the DTC return?

Yes

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information. Refer to MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to PCM VERIFICATION TEST.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to PCM VERIFICATION TEST.

C0507-00-RIGHT FRONT WHEEL SPEED SENSOR RANGE/PERFORMANCE

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCS.
- Vehicle speed above 40 km/h (25 mph).

SET CONDITION

- Anti-lock Brake System Module (ABS) detects if the wheel speed signal is 0 km/h (0 mph) or very low when compared to the other wheel speed signals.
- Incorrect Wheel Speed Sensor (WSS) installed on vehicle.
- One wheel speed sensor signal direction not detected.
- Wheel Speed Sensor (WSS) direction mismatch with other WSSs at speeds above 15 km/h (10 mph).

DEFAULT ACTION

- Anti-lock Brake System (ABS) indicator light illuminated.
- Electronic Stability Control (ESC) indicator light illuminated.
- Electric Park Brake (EPB) indicator light illuminated.
- ABS is disabled.
- ESC is disabled.

POSSIBLE CAUSES

Possible Causes
WHEEL SPEED SENSOR (WSS) CIRCUIT RELATED DTCS
IMPROPER TIRE PRESSURES/MISMATCHED TIRES
WHEEL SPEED SENSOR FOR LOOSENESS
CONNECTOR/TERMINAL DAMAGE
DEBRIS IN ENCODER/BEARING/TONE WHEEL/SENSOR
ENCODER/BEARING/TONE WHEEL DAMAGE
HUB/WHEEL BEARING/TONE WHEEL/AXLE SHAFT
WHEEL SPEED SENSOR (WSS)
ANTI-LOCK BRAKE SYSTEM MODULE (ABS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR WHEEL SPEED SENSOR (WSS) CIRCUIT RELATED DTCS

1. Refer to the recorded DTCS.

Are there any WSS circuit related DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE WHEEL SPEED SENSOR (WSS) SIGNALS

1. Turn the ignition on.
2. With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: **If graph shows periodic dropouts pay close attention to the tone wheel.**

3. Slowly accelerate as straight as possible from a stop to 40 km/h (25 mph).

Is the Right Front WSS speed showing 0 km/h (0 mph), not matching other wheels, or showing erratic behavior?

Yes

- Go To [4](#)

No

- Perform the ABS-INTERMITTENT CONDITION TEST. Refer to [ABS INTERMITTENT CONDITION](#) .

4. CHECK FOR IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES

1. Turn the ignition off.
2. Check and adjust the Right Front Tire pressure.
3. Check and adjust all other tire pressures.
4. Inspect for mismatched tires on vehicle.

Is the Right Front Tire improperly inflated or mismatched tires on vehicle?

Yes

- Repair as necessary
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE RIGHT FRONT WSS FOR LOOSENESS/DEBRIS, INSPECT CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: **Check all terminals for broken, bent, pushed out, or corroded terminals.**

1. Turn the ignition off.
2. Check the Right Front WSS for looseness/debris, excessive corrosion and not properly fastened.
3. Inspect the ABS Module harness connector and the Right Front WSS harness connector.
4. Inspect the (B6) Right Front WSS (-) and (B7) Right Front WSS (+) circuits between the Right Front WSS and ABS for damage.

Was the Right Front WSS loose/debris or any of the wiring/connectors/terminals damaged?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE RIGHT FRONT ENCODER/WHEEL BEARING FOR DEBRIS

1. Inspect the Right Front Encoder/Wheel Bearing for debris.

Was there debris on the Encoder/Wheel Bearing?

Yes

- Clean the Encoder/Wheel Bearing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK RIGHT FRONT ENCODER/WHEEL BEARING OR HUB FOR DAMAGE

1. Check the Right Front Encoder/Wheel Bearing or Hub for excessive runout, clearance or damage.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Front Encoder/Wheel Bearing or Hub Damaged?

Yes

- Replace the Wheel Bearing/Hub in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. REPLACE THE RIGHT FRONT WHEEL SPEED SENSOR (WSS) AND TEST FOR DTCS

1. Replace the Right Front Wheel Speed Sensor (WSS) in accordance with the Service Information. Refer to [SENSOR, WHEEL SPEED, FRONT, REMOVAL AND INSTALLATION](#) .
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

3. Road test the vehicle over 40 km/h (25 mph).

NOTE: Vehicle must be driven for several minutes above 40 km/h (25 mph) for set conditions to be meet.

4. With the scan tool, read ABS DTCS.

Does the DTC remain active?

Yes

- Go To [2](#)

No

- Test complete.

9. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS DTCs.

Did the DTC return?

Yes

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information. Refer to [MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

C0511-00-LEFT REAR WHEEL SPEED SENSOR "A" CORRELATION

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCS.
- Vehicle speed.

SET CONDITION

- Anti-lock Brake System (ABS) Module detects a wheel speed signal is 0 km/h (0 mph) or very low when compared to the other wheel speed signals.

DEFAULT ACTION

- Malfunction Indicator Light (MIL) illuminated.
- Anti-lock Brake System (ABS) indicator light illuminated.
- Electronic Stability Control (ESC) System indicator light illuminated.
- ABS disabled.
- ESC disabled.

POSSIBLE CAUSES

Possible Causes
WHEEL SPEED SENSOR (WSS) CIRCUIT DTCS
WHEEL SPEED SENSOR (WSS) FOR LOOSENESS OR MECHANICAL DAMAGE
CONNECTOR/TERMINAL DAMAGE
WHEEL SPEED SENSOR (WSS)
ANTI-LOCK BRAKE SYSTEM MODULE (ABS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER WHEEL SPEED SENSOR (WSS) DTCS

1. Refer to the recorded DTCs.

Are there any other WSS DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE WHEEL SPEED SENSOR (WSS) SIGNALS

1. Turn the ignition on.
2. With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If the graph shows periodic dropouts pay close attention to the tone wheel.

3. Slowly accelerate as straight as possible from a stop to 40 km/h (25 mph).

Is the Left Front WSS speed showing 0 km/h (0 mph), or not matching other wheels, or showing erratic behavior?

Yes

- Go To [4](#)

No

- Perform the ABS-INTERMITTENT CONDITION TEST. Refer to [ABS INTERMITTENT CONDITION](#).

4. CHECK THE WSS FOR LOOSENESS/DEBRIS AND INSPECT HARNESS/CONNECTORS/TERMINALS FOR DAMAGE

1. Turn the ignition off.

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

2. Check the WSS for looseness/debris, excessive corrosion and not properly fastened.
3. Visually inspect all the WSS connectors, harnesses for damage.

4. Visually inspect all the WSS for proper mounting or damage.

Where any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE WHEEL SPEED SENSOR (WSS) AND TEST FOR DTCS

1. Replace the Wheel Speed Sensor (WSS) in accordance with the Service Information. Refer to **SENSOR, WHEEL SPEED, FRONT, REMOVAL AND INSTALLATION** .
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

3. Road test the vehicle over 40 km/h (25 mph).

NOTE: Vehicle must be driven for several minutes above 40 km/h (25 mph) for set conditions to be meet.

4. With the scan tool, read ABSO DTCs.

Does the DTC remain active?

Yes

- Go To [6](#)

No

- Test complete.

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS Module harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS Module harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS DTCs.

Did the DTC return?

Yes

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information. Refer to MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to PCM VERIFICATION TEST.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to PCM VERIFICATION TEST.

C0517-00-RIGHT REAR WHEEL SPEED SENSOR "A" CORRELATION

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCS.
- Vehicle speed.

SET CONDITION

- Anti-lock Brake System (ABS) Module detects a wheel speed signal is 0 km/h (0 mph) or very low when compared to the other wheel speed signals.

DEFAULT ACTION

- Malfunction Indicator Light (MIL) illuminated.
- Anti-lock Brake System (ABS) indicator light illuminated.
- Electronic Stability Control (ESC) System indicator light illuminated.

- ABS disabled.
- ESC disabled.

POSSIBLE CAUSES

Possible Causes

WHEEL SPEED SENSOR (WSS) CIRCUIT DTCS
 WHEEL SPEED SENSOR (WSS) FOR LOOSENESS OR MECHANICAL DAMAGE
 CONNECTOR/TERMINAL DAMAGE
 WHEEL SPEED SENSOR (WSS)
 ANTI-LOCK BRAKE SYSTEM MODULE (ABS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
 Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER WHEEL SPEED SENSOR (WSS) DTCS

1. Refer to the recorded DTCs.

Are there any other WSS DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE WHEEL SPEED SENSOR (WSS) SIGNALS

1. Turn the ignition on.

2. With the scan tool, monitor and graph ALL the WSS speeds and compare graph while an assistant drives the vehicle.

NOTE: If the graph shows periodic dropouts pay close attention to the tone wheel.

3. Slowly accelerate as straight as possible from a stop to 40 km/h (25 mph).

Is the Left Front WSS speed showing 0 km/h (0 mph), or not matching other wheels, or showing erratic behavior?

Yes

- Go To [4](#)

No

- Perform the ABS-INTERMITTENT CONDITION TEST. Refer to [ABS INTERMITTENT CONDITION](#) .

4. CHECK THE WSS FOR LOOSENESS/DEBRIS AND INSPECT HARNESS/CONNECTORS/TERMINALS FOR DAMAGE

1. Turn the ignition off.

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

2. Check the WSS for looseness/debris, excessive corrosion and not properly fastened.
3. Visually inspect all the WSS connectors, harnesses for damage.
4. Visually inspect all the WSS for proper mounting or damage.

Where any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE WHEEL SPEED SENSOR (WSS) AND TEST FOR DTCS

1. Replace the Wheel Speed Sensor (WSS) in accordance with the Service Information. Refer to [SENSOR, WHEEL SPEED, FRONT, REMOVAL AND INSTALLATION](#) .
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

WARNING: To avoid personal injury or death, check brake capability is available before road testing.

3. Road test the vehicle over 40 km/h (25 mph).

NOTE: Vehicle must be driven for several minutes above 40 km/h (25 mph) for set conditions to be meet.

4. With the scan tool, read ABS DTCs.

Does the DTC remain active?

Yes

- Go To [6](#)

No

- Test complete.

6. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS Module harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS Module harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS DTCs.

Did the DTC return?

Yes

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information. Refer to [MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

C053E-00-BRAKE PRESSURE SENSOR 1 CIRCUIT LOW

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a fault with the Brake Pressure Sensor signal message received over the CAN BUS from the Anti-lock Brake System (ABS) Module.

DEFAULT ACTION

- This is a non-MIL fault.
- The stop/start feature will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
HYDRAULIC CONTROL UNIT (HCU) INTEGRATED CONTROL UNIT (ICU) ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This is a informational DTC indicating a fault is set in the Antilock Brake System (ABS) Module. Perform the appropriate diagnostic procedure(s). Refer to [**ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX**](#).

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#).

C053F-00-BRAKE PRESSURE SENSOR 1 CIRCUIT HIGH

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a fault with the Brake Pressure Sensor signal message received over the CAN BUS from the Anti-lock Brake System (ABS) Module.

DEFAULT ACTION

- This is a non-MIL fault.
- The stop/start feature will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
HYDRAULIC CONTROL UNIT (HCU) INTEGRATED CONTROL UNIT (ICU) ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This is a informational DTC indicating a fault is set in the Antilock Brake System (ABS) Module. Perform the appropriate diagnostic procedure(s). Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

C0542-00-BRAKE PRESSURE SENSOR 2 CIRCUIT LOW

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a fault with the Brake Pressure Sensor signal message received over the CAN BUS from the Anti-lock Brake System (ABS) Module.

DEFAULT ACTION

- This is a non-MIL fault.
- The stop/start feature will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
HYDRAULIC CONTROL UNIT (HCU)
INTEGRATED CONTROL UNIT (ICU)
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This is a informational DTC indicating a fault is set in the Antilock Brake System (ABS) Module. Perform the appropriate diagnostic procedure(s). Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

C0543-00-BRAKE PRESSURE SENSOR 2 CIRCUIT HIGH

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

- This diagnostic runs continuously with the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a fault with the Brake Pressure Sensor signal message received over the CAN BUS from the Anti-lock Brake System (ABS) Module.

DEFAULT ACTION

- This is a non-MIL fault.
- The stop/start feature will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
HYDRAULIC CONTROL UNIT (HCU) INTEGRATED CONTROL UNIT (ICU) ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This is a informational DTC indicating a fault is set in the Antilock Brake System (ABS) Module. Perform the appropriate diagnostic procedure(s). Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX**.

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

P0001-00-FUEL QUANTITY REGULATOR CONTROL CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information .**

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The PCM meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Fuel Quantity Solenoid Control circuit for 0.2 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
FUEL QUANTITY SOLENOID 12-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
FUEL QUANTITY SOLENOID CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL QUANTITY SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE FUEL QUANTITY SOLENOID (K365) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE FUEL QUANTITY SOLENOID (K366) 12-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE FUEL QUANTITY SOLENOID AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Fuel Quantity Solenoid in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.

4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Fuel Quantity Solenoid repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0003-00-FUEL QUANTITY REGULATOR CONTROL CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The PCM meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Quantity Solenoid Control circuit is shorted to ground for 0.20 second.

DEFAULT ACTION

- The MIL will illuminate.
- Throttle input and vehicle speed are limited.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL QUANTITY SOLENOID 12-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
FUEL QUANTITY SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
FUEL QUANTITY SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK ALL POWER SUPPLY CIRCUITS TO THE PCM FOR OPEN/HIGH RESISTANCE

1. Turn the ignition on.
2. Using the complete Wiring diagrams, measure the voltage of each 12-Volt Supply, ASD Supply, and Ignition voltage feed to the PCM at the PCM harness connectors.

Was the voltage at each circuit within 1.0 volt of Battery voltage?

Yes

- Go To [3](#)

No

- Repair the supply circuit that was not within 1.0 volt of Battery voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE FUEL QUANTITY SOLENOID (K366) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Fuel Quantity Solenoid harness connector.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and the Fuel Quantity Solenoid (K366) Control circuit at the Fuel Quantity Solenoid harness connector.

Is there continuity between ground and the Fuel Quantity Solenoid (K366) Control circuit?

Yes

- Repair the Fuel Quantity Solenoid (K366) Control circuit for an open circuit or short to ground condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL QUANTITY SOLENOID (K365) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the Fuel Quantity Solenoid Control (K365) circuit at the Fuel Quantity Solenoid harness connector.

Is there continuity between ground and the Fuel Quantity Solenoid Control (K365) circuit?

Yes

- Repair the Fuel Quantity Solenoid Control (K365) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL QUANTITY SOLENOID FOR PROPER OPERATION

1. Connect the PCM C2 harness connector.
2. Connect the Fuel Quantity Control Solenoid harness connector.
3. Turn the ignition on.
4. With the scan tool, select Erase DTCs.
5. Turn the ignition off.
6. Disconnect the Fuel Quantity Solenoid harness connector.
7. With the scan tool, read DTCs.

NOTE: The scan tool should display the P0001-Fuel Quantity Solenoid Control Circuit Open DTC as active or pending with the harness connector unplugged.

Does the scan to display as described above?

Yes

- Replace the Fuel Quantity Solenoid in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0004-00-FUEL QUANTITY REGULATOR CONTROL CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The PCM meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Quantity Solenoid Control circuit is shorted to voltage for 0.20 second.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
FUEL QUANTITY SOLENOID 12-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
FUEL QUANTITY SOLENOID CONTROL CIRCUIT SHORTED TO VOLTAGE
FUEL QUANTITY SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any charging system or Battery voltage DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE FUEL QUANTITY SOLENOID (K366) 12-VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE FUEL QUANTITY SOLENOID (K365) CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0016-00-CRANKSHAFT/CAMSHAFT TIMING MISALIGNMENT - BANK 1 SENSOR 1

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The crankshaft and camshaft positions of the engine are used in parallel to calculate the engine synchronization states and to control the necessary interrupts including gas exchange and fuel injection. The crankshaft and camshaft positions are calculated based on the readings of the crankshaft and camshaft position sensors.

The camshaft position sensor is located next to the camshaft, the crankshaft position sensor next to the crankshaft. The sensors are checked for circuit failures during operation. They are also checked for range of

position which could change in the case where a tensioner or chain fails. The crankshaft sensor is assumed to be working properly in this case as long as there are no Crankshaft Position Sensor (CKP) faults present. If you have this fault and no other codes set on the 3.0L diesel the Camshaft Position Sensor, related wiring and mechanical failures are the likely causes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine cranking and running.
- Crankshaft is rotating forward.
- P0336 is not active.

SET CONDITION

- Powertrain Control Module detects an error when the camshaft position is out of phase with the crankshaft position.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ERRATIC CAM POSITION SENSOR 1 SIGNAL
ERRATIC CRANKSHAFT POSITION SENSOR SIGNAL
CAMSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
CRANKSHAFT MAGNETIC TONE WHEEL
CAMSHAFT POSITION SENSOR (CMP)
CRANKSHAFT POSITION SENSOR (CKP)
TIMING GEAR MISALIGNMENT/INCORRECT VALVE TIMING

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

NOTE: It maybe necessary to test drive the vehicle and allow cam phasing to occur in order to reset the fault.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are the P0340 or P0344 DTCs present?

Yes

- Perform the applicable diagnostic procedure(s) before continuing with this test procedure. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE CAMSHAFT POSITION SENSOR (CMP) WIRE HARNESS AND CONNECTORS FOR DAMAGE

1. Turn the ignition off.
2. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.
3. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.
4. Make sure the Camshaft Position Sensor is properly installed and the mounting bolt(s) are torqued to their proper specification.

Were any of the above conditions present?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE CAMSHAFT POSITION SENSOR (CMP) AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Camshaft Position Sensor (CMP) Sensor in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty CMP Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0030-00-O2 SENSOR 1/1 HEATER CIRCUIT

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Oxygen Sensor Heater commanded on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a no load condition on the O2 Sensor 1/1 Heater Control circuit for 5.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the O2 Sensor 1/1 (K79) Heater Control circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. REPLACE THE OXYGEN SENSOR 1/1 AND RETEST FOR DTCS

1. Reconnect the PCM C1 harness connector.
2. Replace the Oxygen Sensor in accordance with the Service Information.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Monitor the scan tool for at least two minutes.
6. With the scan tool, read DTCS.

Is the DTC active or pending?

Yes

- Go To [4](#)

No

- Replacing the faulty Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCS.

10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0031-00-O2-SENSOR 1/1 HEATER CIRCUIT LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Oxygen Sensor Heater command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the O2 Sensor 1/1 Heater Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORT TO GROUND
FUSED ASD RELAY OUTPUT CIRCUIT OPEN OR SHORTED TO GROUND
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the O2 Sensor 1/1 (K79) Heater Control circuit at the Oxygen Sensor connector.

Does the O2 Sensor 1/1 (K79) Heater Control circuit show continuity to ground?

Yes

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. REPLACE THE OXYGEN SENSOR AND RETEST FOR DTC

1. Reconnect the PCM C1 harness connector.
2. Replace the Oxygen Sensor in accordance with the Service Information.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Monitor the scan tool for at least two minutes.
6. With the scan tool, read DTCs.

Is the DTC active or pending?

Yes

- Go To [4](#)

No

- Replacing the Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0032-00-O2-SENSOR 1/1 HEATER CIRCUIT HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

- The Oxygen Sensor Heater command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects voltage beyond a calibrated threshold for 5.0 seconds on the O2 Sensor 1/1 Heater Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORT TO VOLTAGE
ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the O2 Sensor 1/1 harness connector.
2. Measure the voltage on the O2 Sensor 1/1 (K79) Heater Control circuit in the O2 Sensor 1/1 harness connector.

Is there any voltage present?

Yes

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE ASD RELAY (F343) OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: An open ASD Relay output or heater control circuit will typically set a heater circuit low fault with one exception. During a cold start, in extreme cold ambient temperatures, the heater circuit high fault can set if there is an open in the heater circuitry.

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the ASD Relay (F343) Output circuit at the O2 Sensor 1/1 harness connector. **Note:** refer to the example illustration.

NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

2.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ASD Relay (F343) Output circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. REPLACE THE O2 SENSOR 1/1 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the O2 Sensor 1/1 in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty O2 Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0045-00-TURBOCHARGER BOOST CONTROL CIRCUIT/OPEN

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Turbo Actuator is mounted to the Variable Geometry Turbocharger (VGT). The Powertrain Control Module (PCM) communicates with the actuator on a Private CAN BUS and controls the actuator. The boost pressure is changed by varying the position of the vanes within the Turbocharger. The Turbocharger Boost Pressure Actuator reports faults to the PCM on private CAN.

The VGT Actuator has a position sensor that is integrated into the housing of the actuator case. The turbocharger boost control circuit is controlled by an application specific power stage IC (ASIC) with an internal low side PWM control circuit. The ASIC performs the circuit diagnosis and communicates circuit faults to the microcontroller via a Micro Second Channel (MSC) interface bus. This position sensor supplies feedback on commanded changes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- When the Boost Pressure Actuator Control is not commanded on.

SET CONDITION

- The Powertrain Control Module (PCM) detects the Boost Pressure Actuator Control circuit has an open load.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
BOOST PRESSURE ACTUATOR CONTROL CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUSED ASD RELAY (F343) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

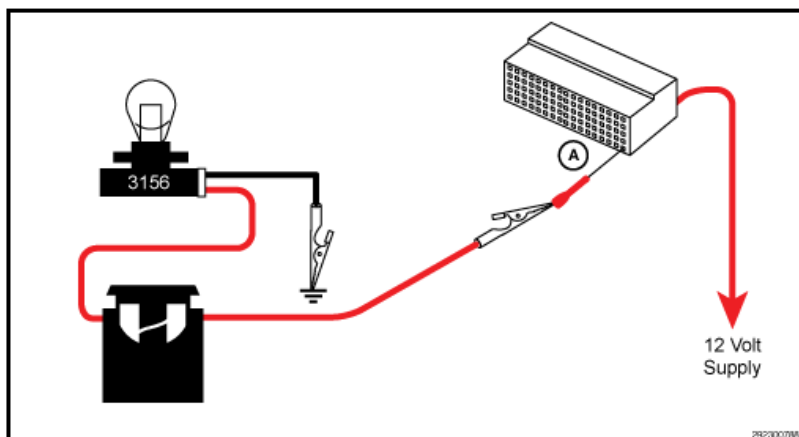
1. Turn the ignition off.
2. Disconnect the Boost Pressure Actuator harness connector.
3. Turn the ignition on.

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: An open ASD Relay output or heater control circuit will typically set a heater circuit low fault with one exception. During a cold start, in extreme cold ambient temperatures, the heater circuit high fault can set if there is an open in the heater circuitry.

CAUTION: Do not load test any circuits with components still connected to the circuit.

4. Load test the ASD Relay (F343) Output circuit at the Boost Pressure Actuator connector. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the bulb on the load test tool illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the Fused ASD Relay (F343) Output circuit for an open or high resistance. Inspect the related fuse, an open fuse may indicate a short to ground in the circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Boost Pressure Actuator (K137) Control circuit between the Boost Pressure Actuator harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Boost Pressure Actuator (K137) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE BOOST PRESSURE ACTUATOR

1. Reconnect the Boost Pressure Actuator harness connector.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Boost Pressure Actuator harness connector.
7. Connect a jumper between ground and the Boost Pressure Actuator (K137) Control circuit at the Boost Pressure Actuator harness connector.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

NOTE: The scan tool should display the P0047-TURBOCHARGER BOOST CONTROL CIRCUIT LOW DTC with the jumper in place.

Does the scan tool display as described above?

Yes

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0046-00-TURBOCHARGER BOOST CONTROL CIRCUIT PERFORMANCE

For a complete TURBO CHARGER SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Turbo Actuator is mounted to the Variable Geometry Turbocharger (VGT). The Powertrain Control Module (PCM) controls boost pressure by changing the position of the variable vanes within the Turbocharger. The PCM uses the VGT Actuator and a pushrod to make these changes.

The VGT Actuator is controlled and monitored by the Powertrain Control Module (PCM). The PCM controls the VGT Actuator using an H-bridge that periodically reverses (or removes) the current and polarity of two control circuits connected to a DC motor. The PCM utilizes Pulse Width Modulated (PWM) voltage to monitor and control the varying loads on the actuator during operation. This helps prevent overheating of the DC motor.

The VGT Actuator has a position sensor that is integrated into the housing of the actuator case. This position sensor functions as a typical three wire 5-Volt sensor. The PCM receives feedback from the position sensor signal wire.

WHEN MONITORED

With the ignition on.

SET CONDITION

The Powertrain Control Module (PCM) detects the target vs. actual Turbo Actuator position and/or the current draw on the two control circuits is greater than a calibrated threshold for a pre-determined amount of time.

POSSIBLE CAUSES

Possible Causes
DEBRIS RESTRICTING THE MOVEMENT OF THE TURBO ACTUATOR
TURBO ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine at least twice and allow it to reach normal operating temperature.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are Turbo Actuator Boost Control DTCS, P0045-00, P0047-00, P0048-00, P004C-00, or P004D-00, Active or Pending? Or, are either of the Turbo Actuator Position Sensor DTCS, P2564-00 or P2565-00, Active or Pending?

Yes, to either question.

- Perform the applicable diagnostic procedure(s) before continuing with this Diagnostic. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. INSPECT THE TURBO ACTUATOR AND PUSHROD FOR DEBRIS OR OTHER FOREIGN MATERIAL THAT COULD INHIBIT NORMAL OPERATION

1. Turn the ignition off.
2. Visually inspect the Turbo Actuator and pushrod for debris or other foreign material that could inhibit normal operation.

Was there debris or other foreign material present that could inhibit proper operation?

Yes

- If the debris or other foreign material can be successfully cleaned and/or removed, perform a cleanup as needed. Then, using the When Monitored and Set Conditions above and recorded data, operate the vehicle within the conditions that set the DTC to make sure the condition has been repaired.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.
- If debris or foreign material cannot be successfully cleaned;
- Go To [4](#)

No

- Go To [4](#)

4. REPLACE THE TURBO ACTUATOR AND RETEST FOR DTCS

NOTE: **The Turbo Actuator may not be serviced separately from the Turbocharger.**

1. Replace the Turbo Actuator in accordance with the Service Information.
2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCS.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Turbo Actuator repaired the condition.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0047-00-TURBOCHARGER BOOST CONTROL CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Turbo Actuator is mounted to the Variable Geometry Turbocharger (VGT). The Powertrain Control Module (PCM) communicates with the actuator on a Private CAN BUS and controls the actuator. The boost pressure is changed by varying the position of the vanes within the Turbocharger. The Turbocharger Boost Pressure Actuator reports faults to the PCM on private CAN.

The VGT Actuator has a position sensor that is integrated into the housing of the actuator case. The turbocharger boost control circuit is controlled by an application specific power stage IC (ASIC) with an internal low side PWM control circuit. The ASIC performs the circuit diagnosis and communicates circuit faults to the microcontroller via a Micro Second Channel (MSC) interface bus. This position sensor supplies feedback on commanded changes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on or engine running.
- With the Boost Pressure Actuator Control circuit commanded off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Boost Pressure Actuator Control circuit.

DEFAULT ACTION

- The MIL will illuminate.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
BOOST PRESSURE ACTUATOR CONTROL CIRCUIT SHORT TO GROUND
BOOST PRESSURE ACTUATOR CONTROL CIRCUIT SHORTED TO THE BOOST PRESSURE ACTUATOR GROUND CIRCUIT
TURBOCHARGER ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Boost Pressure Actuator harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the Boost Pressure Actuator (K137) Control circuit in the Turbocharger Boost Pressure Actuator harness connector.

Is there continuity between ground and the Boost Pressure Actuator (K137) Control circuit?

Yes

- Repair the Boost Pressure Actuator (K137) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR A SHORT TO THE (Z908) GROUND CIRCUIT

1. Check for continuity between the Boost Pressure Actuator (K137) Control circuit and the (Z908) Ground circuit at the Turbocharger Boost Actuator harness connector.

Is there continuity between the Boost Pressure Actuator (K137) Control circuit and the (Z908) Ground circuit?

Yes

- Repair the short between the Boost Pressure Actuator (K137) Control circuit and the (Z908) Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR PROPER OPERATION

1. Reconnect the Turbocharger Boost Actuator harness connector.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Boost Pressure Actuator harness connector.

7. Turn the ignition on.
8. With the scan tool, read DTCs.

NOTE: The scan tool should display the **P0045-00-TURBOCHARGER BOOST CONTROL CIRCUIT/OPEN** as active or pending with the connector disconnected.

Does the scan tool display as described above?

Yes

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0048-00-TURBOCHARGER BOOST CONTROL CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Turbo Actuator is mounted to the Variable Geometry Turbocharger (VGT). The Powertrain Control Module (PCM) communicates with the actuator on a Private CAN BUS and controls the actuator. The boost pressure is changed by varying the position of the vanes within the Turbocharger. The Turbocharger Boost Pressure Actuator reports faults to the PCM on private CAN.

The VGT Actuator has a position sensor that is integrated into the housing of the actuator case. The turbocharger boost control circuit is controlled by an application specific power stage IC (ASIC) with an internal low side PWM control circuit. The ASIC performs the circuit diagnosis and communicates circuit faults to the microcontroller via a Micro Second Channel (MSC) interface bus. This position sensor supplies feedback on commanded changes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Turbocharger boost control is commanded on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Boost Pressure Actuator Control circuit is shorted to voltage.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
BOOST PRESSURE ACTUATOR CONTROL CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE ACTUATOR CONTROL SHORTED TO THE FUSED ASD RELAY OUTPUT CIRCUIT
TURBOCHARGER ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Turbocharger Boost Actuator harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Boost Pressure Actuator (K137) Control circuit in the Boost Pressure Actuator harness connector.

Is there any voltage present?

Yes

- Repair the Boost Pressure Actuator (K137) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL FOR A SHORT TO THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between the Boost Pressure Actuator (K137) Control circuit and the Fused ASD Relay (F343) Output circuit at the Boost Pressure Actuator harness connector.
4. Check for continuity between the Boost Pressure Actuator (K137) Control circuit and all other circuits in the PCM C1 connector.

Is there continuity between the Boost Pressure Actuator (K137) Control circuit and the (F343) Fused ASD Relay Output circuit or any other circuit in the PCM C1 connector?

Yes

- Repair the Boost Pressure Actuator (K137) Control circuit for a short to the circuit that shows continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE BOOST PRESSURE ACTUATOR FOR PROPER OPERATION

1. Reconnect the Turbocharger Boost Actuator harness connector.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Turbocharger Boost Actuator harness connector.
7. Turn the ignition on.
8. With the scan tool read DTCs.

NOTE: **With the connector disconnected the scan tool should display P0045-TURBOCHARGER BOOST CONTROL CIRCUIT/OPEN.**

Does the scan tool display as described above?

Yes

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0053-00-O2 SENSOR 1/1 HEATER RESISTANCE

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer

period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Oxygen Sensor Heater command on.
- Battery voltage is greater than a calibrated value for more than a calibrated amount of time.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the O2 Sensor temperature is above it's maximum threshold or below it's minimum threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN (O2) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

- 1.
2. Measure the resistance of the O2 Sensor 1/1 Heater (K79) Control circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the O2 Sensor 1/1 Heater (K79) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

- 1.
2. Measure the resistance of the (F343) Fused ASD Relay Output circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (F343) Fused ASD Relay Output circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE OXYGEN SENSOR 1/1 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Replace the Oxygen Sensor 1/1 in accordance with the Service Information.
4. Start the engine.
5. Allow the engine to reach normal operating temperature.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Is the DTC active or pending?

Yes

- Go To [5](#)

No

- Replacing the Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0054-00-02 SENSOR HEATER 1-2 RESISTANCE

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O₂ Sensor. This sensor operates differently from traditional O₂ Sensors. The wide-band O₂ Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement

chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1, 000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Oxygen Sensor Heater command on.
- Battery voltage is greater than a calibrated value for more than a calibrated amount of time.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the O2 Sensor temperature is above it's maximum threshold or below it's minimum threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN (O2) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE O2 SENSOR 1/1 HEATER (K79) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the O2 Sensor 1/1 Heater (K79) Control circuit in the Oxygen Sensor harness connector.

Is there continuity between ground and the O2 Sensor 1/1 Heater (K79) Control circuit?

Yes

- Repair the (K79) O2 Sensor 1/1 Heater (K79) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE O2 SENSOR 1/1 HEATER (K79) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

- 1.
2. Measure the resistance of the O2 Sensor 1/1 Heater (K79) Control circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the O2 Sensor 1/1 Heater (K79) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. REPLACE THE OXYGEN SENSOR 1/1 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.

3. Replace the Oxygen Sensor 1/1 in accordance with the Service Information.
4. Start the engine.
5. Allow the engine to reach normal operating temperature.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Is the DTC active or pending?

Yes

- Go To [5](#)

No

- Replacing the Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P006D-00-BAROMETRIC PRESSURE - INLET AIR PRESSURE CORRELATION

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects a plausibility error between the Inlet Air Pressure Sensor Signal and the BARO Pressure Sensor Signal for 4.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, record all Freeze frame data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are the P012C-00, P012D-00 or any 5-Volt Supply DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE MAF/INTAKE AIR SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Turn the ignition on.
4. While monitoring the scan tool, connect a jumper between the (K188) 5-Volt Supply circuit and the MAF Sensor (K68) Pressure Signal circuit at the MAF/Intake Air Sensor harness connector.

Did the P012D-00 DTC set with the jumper in place?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0072-00-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW

For a complete A/C CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Ambient Air Temperature Sensor is a two wire sensor that is hard wired to the Drivers Door Module (DDM). On some vehicles not equipped with DDM, the wiring goes directly to the Body Control Module (BCM). The DDM (or BCM) supplies a 5-Volt signal and a sensor ground to the Ambient Air Temperature (AAT) Sensor. The sensor internal resistance changes in response to changes in ambient temperature. In both options, it is the BCM that broadcasts the AAT Sensor signal over the Can C Bus. The Powertrain Control Module (PCM) acquires the AAT Sensor signal from the Can C Bus.

NOTE: If a repair is performed to the AAT Sensor wiring, or a sensor is replaced to correct and active DTC, the vehicle must be driven for a minimum of 5 minutes above 15 mph to update the AAT temp signal before the DTC will go stored and can be erased.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the AAT Sensor signal voltage is below a calibrated threshold for 0.5 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AAT SENSOR TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
AAT SENSOR TEMPERATURE SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
AMBIENT AIR TEMPERATURE (AAT) SENSOR
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any CAN C Bus Communication DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO READ THE AMBIENT AIR TEMPERATURE SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the AAT harness connector.
3. Turn the ignition on, engine not running.
4. With a scan tool, read DTCs.

NOTE: The scan tool should display the **P0073-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH DTC** with the connector disconnected.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact at the AAT Sensor and BCM/DDM connectors. Replace the AAT Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE AAT SENSOR (G31) TEMP SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles).
3. Check for continuity between ground and the AAT Sensor (G31) Temperature Signal circuit at the AAT Sensor harness connector.

Is there continuity between ground and the AAT Sensor (G31) Temperature Signal circuit?

Yes

- Repair the AAT Sensor (G31) Temperature Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK THE AAT SENSOR (G31) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO THE (G931) SENSOR GROUND CIRCUIT

1. Check for continuity between the AAT Sensor (G31) Temperature Signal circuit and the (G931) Sensor Ground circuit at the AAT Sensor harness connector.

Is there continuity between the AAT Sensor (G31) Temperature Signal circuit and the (G931) Sensor Ground circuit?

Yes

- Repair the short between the AAT Sensor (G31) Temperature Signal circuit and the (G931) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [6](#)

6. CHECK RELATED DDM OR BCM AND COMPONENT CONNECTIONS

1. Disconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles).
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles). Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Drivers Door Module (or Body Control Module for non-DDM vehicles) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

P0073-00-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH

For a complete A/C CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Ambient Air Temperature Sensor is a two wire sensor that is hard wired to the Drivers Door Module (DDM). On some vehicles not equipped with DDM, the wiring goes directly to the Body Control Module (BCM). The DDM (or BCM) supplies a 5-Volt signal and a sensor ground to the Ambient Air Temperature (AAT) Sensor. The sensor internal resistance changes in response to changes in ambient temperature. In both

options, it is the BCM that broadcasts the AAT Sensor signal over the Can C Bus. The Powertrain Control Module (PCM) acquires the AAT Sensor signal from the Can C Bus.

NOTE: If a repair is performed to the AAT Sensor wiring, or a sensor is replaced to correct and active DTC, the vehicle must be driven for a minimum of 5 minutes above 15 mph to update the AAT temp signal before the DTC will go stored and can be erased.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10-Volts.

SET CONDITION

- The Ambient Air Temperature Sensor voltage is greater than the maximum allowable voltage for 0.5 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AAT SIGNAL CIRCUIT SHORTED TO VOLTAGE
AAT SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
AMBIENT AIR TEMPERATURE (AAT) SENSOR
DRIVERS DOOR MODULE (DDM)
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any CAN C Bus Communication DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE AAT SENSOR (G31) TEMP SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the Ambient Air Temperature Sensor (AAT) harness connector.
2. Measure the voltage on the AAT Sensor (G31) Signal circuit at the AAT Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the AAT Sensor (G31) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE AAT SENSOR (G31) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: The ignition must be off when checking the continuity of a circuit.

1. Disconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles).
Note: Use the appropriate wiring diagram as a guide to follow the path of the circuit.
2. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
3. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
4. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (G931) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: G931 is used on the "BASE" option and C160 on the "PREMIUM", labeled in wiring as "power" consult wiring diagrams for details.

Measure the resistance of the (G931) Sensor Ground circuit from the AAT Sensor harness connector to the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles) using the wiring diagram as a guide.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (G931) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE AAT SENSOR FOR PROPER OPERATION

1. Reconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles).
2. Connect a jumper wire between the AAT Sensor (G31) Signal circuit and the (G931) Sensor Ground circuit in the AAT Sensor harness connector.
3. Turn the ignition on, engine not running.
4. With a scan tool, read DTCs.

NOTE: The scan tool should display the P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW DTC as active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact at the AAT Sensor and DDM harness connector (or BCM C4 harness connector in non-DDM vehicles). If no pin to terminal contact problems are found, replace the Ambient Air Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK RELATED DDM OR BCM AND COMPONENT CONNECTIONS

1. Disconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles).
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect the DDM harness connector (or BCM C4 harness connector in non-DDM vehicles). Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Drivers Door Module (or Body Control Module for non-DDM vehicles) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

P007C-00-CHARGE AIR COOLER TEMPERATURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The **Charge Air Cooler (CAC)** is an air-to-air heat exchange device used on this turbocharged diesel engine to improve efficiency by increasing intake air-charge density through cooling the intake air. A decrease in air intake temperature provides a denser intake charge to the engine and allows more air and fuel to be introduced per engine cycle, increasing the output of the engine.

There are many different variations for intake air temperature sensors and configurations. The 3.0L VM Turbo uses a cooler input air temperature sensor and an output air temperature sensor both are in the intake air flow. There are failure codes for rationality, circuit issues and component failures. The sensors are directly connected to the Powertrain Control Module (PCM). The sensor data is used by the PCM to determine (CAC) efficiency, fuel delivery calculations and temperature rationality measurements.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- Charge Air Cooler Out Temperature Signal circuit is less than 0.26 Volts.

DEFAULT ACTION

- The MIL will illuminate.
- The ETC will illuminate.

POSSIBLE CAUSES

Possible Causes
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SIGNAL CIRCUIT SHORTED TO THE SENSOR RETURN CIRCUIT
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ABILITY OF THE PCM TO MONITOR THE CHARGE AIR COOLER (CAC) OUT TEMPERATURE SENSOR CIRCUIT

1. Turn the ignition off.
2. Disconnect the Charge Air Cooler (CAC) Temperature Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The scan tool should display the P007D-00-CHARGE AIR COOLER TEMPERATURE SENSOR CIRCUIT HIGH DTC as active or pending with the connector disconnected.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact in the CAC Out Temperature Sensor and Powertrain Control Module connectors. If no problems were found with the connectors, replace the CAC Out Temperature Sensor In accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. CHECK THE CAC OUT TEMPERATURE (K49) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between ground and the CAC Out Temperature (K49) Signal circuit at the CAC Out Temperature Sensor harness connector.

Is there continuity between ground and the CAC Out Temperature (K49) Signal circuit?

Yes

- Repair the Charge Air Cooler (CAC) Out Temperature (K49) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE CAC OUT TEMPERATURE (K49) SIGNAL CIRCUIT FOR A SHORT TO THE (K50) SENSOR RETURN CIRCUIT

1. Check for continuity between the CAC Out Temperature (K49) Signal circuit and the (K50) Sensor Return circuit at the CAC Out Temperature Sensor harness connector.

Is there continuity between the CAC Out Temperature (K49) Signal circuit and the (K50) Sensor Return circuit?

Yes

- Repair the short between the CAC Out Temperature (K49) Signal circuit and the (K50) Return circuit.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P007D-00-CHARGE AIR COOLER TEMPERATURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The **Charge Air Cooler (CAC)** is an air-to-air heat exchange device used on this turbocharged diesel engine to improve efficiency by increasing intake air-charge density through cooling the intake air. A decrease in air intake temperature provides a denser intake charge to the engine and allows more air and fuel to be introduced per engine cycle, increasing the output of the engine.

There are many different variations for intake air temperature sensors and configurations. The 3.0L VM Turbo uses a cooler input air temperature sensor and an output air temperature sensor both are in the intake air flow. There are failure codes for rationality, circuit issues and component failures. The sensors are directly connected to the Powertrain Control Module (PCM). The sensor data is used by the PCM to determine (CAC) efficiency, fuel delivery calculations and temperature rationality measurements.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- Charge Air Cooler Out Temperature Signal circuit voltage is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE CAC OUT (K49) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the CAC Out Temperature Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the CAC Out Temperature (K49) Signal circuit at the CAC Out Temperature Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the (K49) Charge Air Cooler Out Temperature Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE CAC OUT TEMPERATURE (K49) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connectors.
3. Measure the resistance of the CAC Out (K49) Temperature Signal circuit between the CAC Out Temperature Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the CAC Out Temperature (K49) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE (K50) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K50) Return circuit between the CAC Out Temperature Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K50) Return circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE CAC OUT TEMPERATURE FOR PROPER OPERATION

1. Reconnect the PCM C1 harness connector.
2. Connect a jumper between the (K49) CAC Out Temperature Signal circuit and the (K50) Sensor Return circuit at the CAC Out Temperature Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCS.

NOTE: The P007C-00 CAC OUT TEMPERATURE SENSOR CIRCUIT LOW DTC should be active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Replace the Charge Air Cooler (CAC) Out Temperature sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0087-00-FUEL RAIL PRESSURE TOO LOW

WARNING: High Pressure fuel lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 23, 200 PSI (1600BAR). Use extreme caution when inspecting for high pressure fuel leaks. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Fuel under this amount of pressure can penetrate skin causing possible serious or fatal injury. Inspect for high pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system. Failure to follow these instructions may result in possible serious or fatal injury.

THEORY OF OPERATION

The **Fuel Injection Pump** (sometimes called the '**High Pressure Delivery Pump (HPDP)** ') is mounted on the Engine and gear driven. It creates high-pressure fuel for the Fuel Rail, which supplies the Fuel Injectors. Fuel enters the Fuel Injection Pump from the electric Lift Pump, which is located inside the Fuel Tank. The Fuel Injection Pump has a built-in cascade overflow valve at the inlet that re-directs excess fuel accumulated during low-pressure delivery. Excess fuel is used to lubricate the Fuel Injection Pump and then returned to the Fuel Tank. The low-pressure fuel delivery continues on to the **Fuel Quantity Solenoid (FQS)** .

The **Powertrain Control Module (PCM)** uses the FQS to meter the amount of low-pressure fuel entering the high-pressure pumping chambers inside the Fuel Injection Pump. The FQS works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is mounted in the HPDP. The PCM supplies the solenoid with a 12 Volt supply and a Pulse Width Modulated (PWM) low side control circuit to control fuel quantity entering the Lift Pump.

The FPR is positioned at the return passage of the Fuel Rail. The FPR default position is open when not being controlled by the PCM. When the FPR is open, it allows fuel pressure in the rail to escape into the return circuit and onward back to the Fuel Tank. When the PCM wants to increase Fuel Rail pressure, it commands the FPR to close, allowing fuel rail pressure to increase and opens to increase fuel returned to the tank and decrease fuel rail pressure.

The PCM monitors fuel pressure at the Fuel Rail. The **Fuel RAIL Pressure Sensor (FRPS)** is a three wire 5-Volt sensor mounted on the Fuel Rail. The FRPS monitors the high-pressure fuel injection system. The PCM uses this value to calculate and adjust the amount fuel pressure in the Fuel Rail. The PCM is then able to maintain constant fuel pressure for proper Fuel Injector operation under varying load conditions.

There are two separate approaches used for this monitor: The **Standard Heat-Up (SHU)** and the **Rapid Heat-Up (RHU)** . Fuel economy and emissions are improved when the engine is allowed to reach a higher operating temperature and engine performance and torque are improved when the engine is operating at a cooler temperatures. The PCM determines which heat-up mode to use based on various environmental and operating conditions.

The PCM uses the P0087-00 monitor when there is a Fuel Rail pressure-low occurrence during the SHU mode.

The PCM uses the P1292-00 monitor when there is a Fuel Rail pressure-low occurrence during the RHU mode.

The PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition. Because the PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The vehicle is being driven under normal operating conditions.

- Engine operating temperature below 82Â°C (180Â°F).

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too low for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
GELLED FUEL
CHASSIS MOUNTED FUEL HEATER-FUEL FILTER
NO VOLTAGE AT CHASSIS MOUNTED FUEL HEATER
AIR IN FUEL SYSTEM
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE FUEL SYSTEM FOR A LEAK

1. Turn the ignition off.

2. Visually inspect the entire fuel system for signs of a leak.

Is there any evidence of leakage?

Yes

- Repair as necessary in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **3**

3. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Check the Fuel System for contamination. Refer to - Fuel System-Fuel Delivery-Standard Procedure-DIESEL FUEL SYSTEM CONTAMINATION.

Is there any evidence of contamination?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE VEHICLE FOR PROPER OPERATING CONDITIONS

1. Determine the environmental conditions at or near the time the DTC set.

Has the vehicle been operated or cold soaked in ambient temperatures below freezing?

Yes

- Go To **5**

No

- Go To **7**

5. CHECK THE FUEL SYSTEM FOR GELLED FUEL BY PERFORMING THE IN-TANK LIFT PUMP FLOW TEST

NOTE: Before performing the IN-TANK FUEL LIFT PUMP FLOW test, verify that the fuel level in the fuel tank is above 1/4 full. If fuel tank is not above 1/4 full the pump will take in air causing the test results to be inaccurate.

1. Disconnect the low pressure fuel supply line from the High Pressure Fuel Pump. Connect the (special tool #8978A, Decay Tool, Fuel) to the low pressure fuel supply line.

WARNING: To reduce the risk of fire and serious possible serious or fatal injury, place the Reservoir Assembly 534960 (3) on the floor and out of the way so that it is not a trip hazard.

2. Perform the following to purge air from the system:

- With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
- Open the Flow Test Valve and allow the fuel to flow into the Reservoir for 15 seconds, then close the Flow Test Valve.

- Turn the ignition off.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
3. Perform the following three times to find the average flow rate:
- With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the Valve.
 - Turn the ignition off.
 - Measure and record the amount of fuel in the Reservoir Assembly.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
4. Add the three recorded measurements and then divide the total by three to calculate the average flow rate.

NOTE: **The flow rate specification is 750 ml in 15 seconds.**

Does the average flow rate meet or exceed the specification?

Yes

- If the vehicle exhibited symptoms related to fuel gelling such as hard start, start and stall, and/or low power, but no longer exhibits these symptoms, fuel gelling may have been present but corrected itself. The fuel temperature may have increased through normal operation or if the vehicle was parked inside a warm building. Verify the fuel heater is receiving power with the ignition on, and also check for proper operation of the fuel heater.
- Add a bottle of MOPAR Premium Fuel Treatment to the Fuel Tank.
- Then, Go To appropriate information.

No

- Leave the Fuel Decay Tester installed. Remove the fuel filter and inspect for fuel gelling/wax build-up and other contaminants. If wax build-up is found, the fuel has gelled. Replace the fuel filter and correct the fuel gelling accordingly before any further testing. Verify the fuel heater is receiving power with the ignition on, and also check for proper operation of the fuel heater.
- If no wax build-up or signs of fuel gelling is found, replace the Fuel Filter/Water Separator in accordance with the Service Information.
- Then, Go To 7

6. RECHECK THE FUEL SYSTEM FOR PROPER IN-TANK FUEL LIFT PUMP FLOW

1. Perform the following to purge air from the system:
- With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the Valve.
 - Turn the ignition off.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
2. Perform the following three times to find the average flow rate:
- With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the valve.
 - Turn the ignition off.
 - Measure and record the amount of fuel in the Reservoir Assembly.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
3. Add the three recorded measurements and then divide the total by three to calculate the average flow rate.

NOTE: **The flow rate specification is 750 ml in 15 seconds.**

Does the average flow rate meet or exceed the specification?

Yes

- Repair complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Use the appropriate wiring diagram as a guide to check the In-Tank Fuel Lift Pump wiring for an open, high resistance, or short to ground. If the In-Tank Fuel Lift Pump wiring is okay, remove the fuel tank and replace the In-Tank Fuel Lift Pump Module in accordance with the Service Information. Also, add a bottle of MOPAR Premium Fuel Treatment to the Fuel Tank.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Refer to [**CHECKING THE FUEL DELIVERY SYSTEM**](#) and perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure.

Were any problems found?

Yes

- Repair as necessary.

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

P0088-00-FUEL RAIL PRESSURE TOO HIGH

WARNING: High Pressure fuel lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 23, 200 PSI (1600BAR). Use extreme caution when inspecting for high pressure fuel leaks. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Fuel under this amount of pressure can penetrate skin causing possible serious or fatal injury. Inspect for high pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system. Failure to follow these instructions may result in possible serious or fatal injury.

THEORY OF OPERATION

The **Fuel Injection Pump** (sometimes called the '**High Pressure Delivery Pump (HPDP)** ') is mounted on the Engine and gear driven. It creates high-pressure fuel for the Fuel Rail, which supplies the Fuel Injectors. Fuel enters the Fuel Injection Pump from the electric Lift Pump, which is located inside the Fuel Tank. The Fuel Injection Pump has a built-in cascade overflow valve at the inlet that re-directs excess fuel accumulated during low-pressure delivery. Excess fuel is used to lubricate the Fuel Injection Pump and then returned to the Fuel Tank. The low-pressure fuel delivery continues on to the **Fuel Quantity Solenoid (FQS)** .

The **Powertrain Control Module (PCM)** uses the FQS to meter the amount of low-pressure fuel entering the high-pressure pumping chambers inside the Fuel Injection Pump. The FQS works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is mounted in the HPDP. The PCM supplies the solenoid with a 12 Volt supply and a Pulse Width Modulated (PWM) low side control circuit to control fuel quantity entering the Lift Pump.

The FPR is positioned at the return passage of the Fuel Rail. The FPR default position is open when not being controlled by the PCM. When the FPR is open, it allows fuel pressure in the rail to escape into the return circuit and onward back to the Fuel Tank. When the PCM wants to increase Fuel Rail pressure, it commands the FPR to close, allowing fuel rail pressure to increase and opens to increase fuel returned to the tank and decrease fuel rail pressure.

The PCM monitors fuel pressure at the Fuel Rail. The **Fuel RAIL Pressure Sensor (FRPS)** is a three wire 5-Volt sensor mounted on the Fuel Rail. The FRPS monitors the high-pressure fuel injection system. The PCM uses this value to calculate and adjust the amount fuel pressure in the Fuel Rail. The PCM is then able to maintain constant fuel pressure for proper Fuel Injector operation under varying load conditions.

There are two separate approaches used for this monitor: The **Standard Heat-Up (SHU)** and the **Rapid Heat-Up (RHU)** . Fuel economy and emissions are improved when the engine is allowed to reach a higher operating temperature and engine performance and torque are improved when the engine is operating at a cooler temperatures. The PCM determines which heat-up mode to use based on various environmental and operating conditions.

The PCM uses the P0087-00 monitor when there is a Fuel Rail pressure-low occurrence during the SHU mode.

The PCM uses the P1292-00 monitor when there is a Fuel Rail pressure-low occurrence during the RHU mode.

The PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition. Because the PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Driving under normal operating conditions.
- Engine operating temperature below 82Â°C (180Â°F).

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too high for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECKING FOR OTHER PCM DTCS

1. With the scan tool, read the PCM DTCs.

Are there any other DTCs present?

Yes

- Repair the other DTCs before continuing.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE FUEL SYSTEM FOR A LEAK

1. Turn the ignition off.
2. Inspect the entire fuel system for leakage.

Is there any evidence of leakage?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Inspect the fuel system for contamination.

Is the fuel contaminated?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE ENGINE FOR PROPER STARTING CONDITIONS

1. With the scan tool, erase the PCM DTCs.
2. Attempt to start the engine.

Does the engine start and idle?

Yes

- Go To [6](#)

No

- Go To [9](#)

6. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. With the scan tool, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure.

NOTE: A sticking Fuel Pressure Regulator is indicated by the Actual Fuel Pressure gradually dropping below the Fuel Pressure Set point then suddenly increasing (spiking) above the Fuel Pressure Set point.

Does the Actual Fuel Pressure gradually decrease then suddenly increase (spike) above the Fuel Pressure Setpoint?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#).

Were there any problems with the Fuel Delivery System?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE FUEL INJECTOR(S) FOR PROPER OPERATION

NOTE: An injector that sticks open can cause this DTC. A sticking injector will cause the engine to misfire and emit excessive black smoke from the exhaust system.

Does the engine exhibit the symptoms described in the above note?

Yes

- Using the service information, remove and inspect the Fuel Injectors for signs of damage or debris that may cause the injector to stick. Sticking injectors may cause the combustion chamber to become black and oil soaked. Replace Injector(s) as necessary.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [9](#)

9. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were there any problems with the Fuel Delivery System?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [10](#)

10. CHECK THE FUEL QUANTITY SOLENOID FOR PROPER OPERATION

1. Turn the ignition off.
2. Turn the ignition on.
3. With the scan tool, erase the PCM DTCs.
4. Attempt to start and test drive the vehicle.
5. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Replace the Fuel Quantity Solenoid in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Test Complete.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0090-00-FUEL PRESSURE 1 CONTROL CIRCUIT/OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The **Fuel Quantity Solenoid (FQS)** works in tandem with the **Fuel Pressure Regulator (FPR)** to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the **High Pressure Delivery Pump (HPDP)**. The FQS receives 12 Volts and a duty-cycle ground signal from the **Powertrain Control Module (PCM)**. The FQS is normally open, so when the FQS is not actuated (no ground signal from the PCM), the HPDP inlet passage is open allowing full fuel flow to the pumping chambers inside the HPDP. When

the PCM grounds the FQS control signal the FQS closes the fuel inlet passage, preventing fuel from entering the pumping chambers. The FPR is positioned at the return passage of the Fuel Rail. The FPR is normally open and when the solenoid is not actuated (no ground signal from the PCM), the Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM grounds the FPR control signal, the solenoid valve closes allowing fuel pressure to build in the rail. The Fuel Pressure Regulator is not serviceable separate of the Fuel Rail Assembly.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Pressure Regulator driver circuit is open.

DEFAULT ACTION

- The MIL will illuminate.
- Throttle input and vehicle speed are limited.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PRESSURE REGULATOR CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL PRESSURE REGULATOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
FUEL PRESSURE REGULATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE FUEL PRESSURE REGULATOR (K646) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Fuel Pressure Regulator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the Fuel Pressure Regulator (K646) Control circuit between the Fuel Pressure Regulator harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the Fuel Pressure Regulator (K646) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE FUEL PRESSURE REGULATOR (K369) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Fuel Pressure Regulator (K369) Return circuit between the Fuel Pressure Regulator harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Fuel Pressure Regulator (K369) Return circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL PRESSURE REGULATOR OPERATION

1. Reconnect the Fuel Pressure Regulator harness connector.
2. Reconnect the Powertrain Control Module C2 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Fuel Pressure Regulator harness connector.
7. Connect a jumper between the Fuel Pressure Regulator (K646) Control circuit and ground.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0091-FUEL PRESSURE CONTROL CIRCUIT LOW DTC with the jumper in place.

Did the scan tool display as described above?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0091-00-FUEL PRESSURE 1 CONTROL CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The **Fuel Quantity Solenoid (FQS)** works in tandem with the **Fuel Pressure Regulator (FPR)** to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the **High Pressure Delivery Pump (HPDP)**. The FQS receives 12 Volts and a duty-cycle ground signal from the **Powertrain Control Module (PCM)**. The FQS is normally open, so when the FQS is not actuated (no ground signal from the PCM), the HPDP inlet passage is open allowing full fuel flow to the pumping chambers inside the HPDP. When the PCM grounds the FQS control signal the FQS closes the fuel inlet passage, preventing fuel from entering the pumping chambers. The FPR is positioned at the return passage of the Fuel Rail. The FPR is normally open and when the solenoid is not actuated (no ground signal from the PCM), the Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM grounds the FPR control signal, the solenoid valve closes allowing fuel pressure to build in the rail. The Fuel Pressure Regulator is not serviceable separate of the Fuel Rail Assembly.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Fuel Pressure Regulator commanded off.

SET CONDITION

- The PCM detects that the Fuel Pressure Regulator Control circuit is shorted to ground.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
FUEL PRESSURE REGULATOR CONTROL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE REGULATOR CONTROL CIRCUIT SHORTED TO THE FUEL PRESSURE REGULATOR RETURN CIRCUIT
FUEL PRESSURE REGULATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE FUEL PRESSURE REGULATOR (K646) CONTROL CIRCUIT FOR A SHORT TO GROUND

- 1.
2. Turn the ignition off.
3. Disconnect the Fuel Pressure Regulator harness connector.
4. Disconnect the PCM C2 harness connector.
5. Check for continuity between ground and the Fuel Pressure Regulator (K646) Control circuit in the Fuel Pressure Regulator harness connector.

Is there continuity between ground and the Fuel Pressure Regulator (K646) Control circuit?

Yes

- Repair the Fuel Pressure Regulator (K646) Control circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE FUEL PRESSURE REGULATOR (K646) CONTROL CIRCUIT FOR A SHORT TO THE FUEL PRESSURE REGULATOR (K369) RETURN CIRCUIT

- 1.
2. Check for continuity between the Fuel Pressure Regulator (K646) control circuit and the Fuel Pressure Regulator (K369) return circuit at the Fuel Pressure Regulator harness connector.

Is there continuity between the Fuel Pressure Regulator (K646) control circuit and the Fuel Pressure Regulator (K369) return circuit?

Yes

- Repair the Fuel Pressure Regulator (K646) control circuit for a short to the Fuel Pressure Regulator (K369) return circuit.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. Reconnect the Fuel Pressure Regulator harness connector.
2. Reconnect the Powertrain Control Module C2 harness connector.

3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Fuel Pressure Regulator harness connector.
7. Turn the ignition on.
8. With the scan tool, read DTCs.

NOTE: The scan tool should display the **P0090-FUEL PRESSURE CONTROL CIRCUIT OPEN** as active or pending with the connector disconnected.

Did the scan tool display as described above?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0092-00-FUEL PRESSURE 1 CONTROL CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The **Fuel Quantity Solenoid (FQS)** works in tandem with the **Fuel Pressure Regulator (FPR)** to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the **High Pressure Delivery Pump (HPDP)**. The FQS receives 12 Volts and a duty-cycle ground signal from the **Powertrain Control Module (PCM)**. The FQS is normally open, so when the FQS is not actuated (no ground signal from the PCM), the HPDP inlet passage is open allowing full fuel flow to the pumping chambers inside the HPDP. When the PCM grounds the FQS control signal the FQS closes the fuel inlet passage, preventing fuel from entering the pumping chambers. The FPR is positioned at the return passage of the Fuel Rail. The FPR is normally open and when the solenoid is not actuated (no ground signal from the PCM), the Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM grounds the FPR control signal, the solenoid valve closes allowing fuel pressure to build in the rail. The Fuel Pressure Regulator is not serviceable separate of the Fuel Rail Assembly.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Fuel Pressure Regulator command on.

SET CONDITION

- The PCM detects excessive current on the Fuel Pressure Regulator (K646) Control circuit.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
FUEL PRESSURE REGULATOR CONTROL CIRCUIT SHORTED TO VOLTAGE
FUEL PRESSURE REGULATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUEL PRESSURE REGULATOR (K646) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Fuel Pressure Regulator harness connector.
3. Disconnect the Powertrain Control Module C2 harness connector.
4. Remove the ASD Relay.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay Connector.
6. Turn the ignition on.
7. Measure the voltage on the Fuel Pressure Regulator (K646) Control circuit in the Fuel Pressure Regulator harness connector.

Is there any voltage present?

Yes

- Repair the Fuel Pressure Regulator (K646) Control circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. Reconnect the Fuel Pressure Regulator harness connector.
2. Reinstall the ASD Relay.
3. Reconnect the Powertrain Control Module C2 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCS.
6. Turn the ignition off.
7. Disconnect the Fuel Pressure Regulator harness connector.
8. Turn the ignition on.

9. Connect a jumper between the Fuel Pressure Regulator (K646) Control circuit and ground.
10. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0090-FUEL PRESSURE CONTROL CIRCUIT OPEN DTC with the connector unplugged and a P0091-FUEL PRESSURE CONTROL CIRCUIT LOW DTC with the jumper in place.

Did the scan tool display the DTCs as described above?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0096-00-INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Pulse-Width Modulated (PWM) Humidity Signal circuit frequency is above or below a calibrated threshold for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

3. CHECK THE INTAKE AIR TEMPERATURE (IAT) 2 (K69) SIGNAL CIRCUIT FOR OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 and the IAT 2 connectors.
3. Measure the resistance of the IAT 2 (K69) Signal circuit between the IAT 2 Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the IAT 2 (K69) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE (K64) SENSOR GROUND CIRCUIT FOR OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K64) Sensor Ground circuit between the IAT 2 Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K64) Sensor Ground circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. REPLACE THE INTAKE AIR TEMPERATURE (IAT) 2 TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Intake Air Temperature 2 in accordance with the Service Information.
3. Connect the Intake Air Temperature 2 and PCM C1 harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P009A-00-INTAKE AIR TEMPERATURE / AMBIENT AIR TEMPERATURE CORRELATION

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor 3 is located at the Turbocharger before the Charge Air Cooler. It is sometimes referred to as the 'Charge Air Cooler Upstream Temperature' Sensor. The described rationality check will detect the IAT Sensor 3 has an output which is inappropriately high (i.e. in range high) or inappropriately low (i.e. in range low). The temperature sensed by the IAT Sensor 3 is compared to the Ambient Air Temperature Sensor after a sufficient amount of engine-off time. The Powertrain Control Module (PCM) illuminates the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects a plausibility error between the Inlet Air Temperature Sensor Signal and the Ambient Air Temperature Sensor Signals.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
INLET AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.

2. With the scan tool, record all Freeze frame data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Did the DTC reset?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Ambient Air Temperature DTCs or are DTCs P00EA or P00EB active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE INTAKE AIR TEMPERATURE (IAT) SENSOR 3 FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the IAT Sensor 3 harness connector.
3. Turn the ignition on.
4. While monitoring the scan tool, connect a jumper between the (K64) Return circuit and the IAT 3 (K69) Signal circuit at the IAT Sensor 3 harness connector.

Did the P00EA DTC set?

Yes

- Replace the Intake Air Temperature Sensor 3 in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P00AF-00-TURBOCHARGER BOOST CONTROL MODULE "A" PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Variable Geometry Turbocharger (VGT) is electronically actuated by the Turbo actuator. The Turbo Actuator is a smart device that receives the commanded vane position from the Powertrain Control Module (PCM) via a PWM signal. The Turbo actuator sends a feedback vane position to the PCM using the Private CAN BUS. If the delta between the commanded Turbo position and feedback turbo position is greater than a calibrated delta for a calibrated amount of time a fault will set.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Closed loop boost control is active.
- Engine speed is greater than a calibrated value.
- Injected fuel quantity is greater than a calibrated value.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Turbocharger Boost Actuator desired and measured positions are outside of a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
PHYSICAL OBSTRUCTION AND/OR BINDING OF THE TURBOCHARGER BOOST ACTUATOR LINKAGE
TURBO BOOST ACTUATOR SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
TURBO BOOST ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fused ASD, power supply or other Motor Boost Pressure Servo DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE TURBOCHARGER ACTUATOR LINKAGE FOR BINDING OR PHYSICAL OBSTRUCTION

Are there any physical issues with the Turbocharger Actuator Linkage?

Yes

- Replace the Turbocharger Actuator in accordance with the Service Information.
- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [5](#)

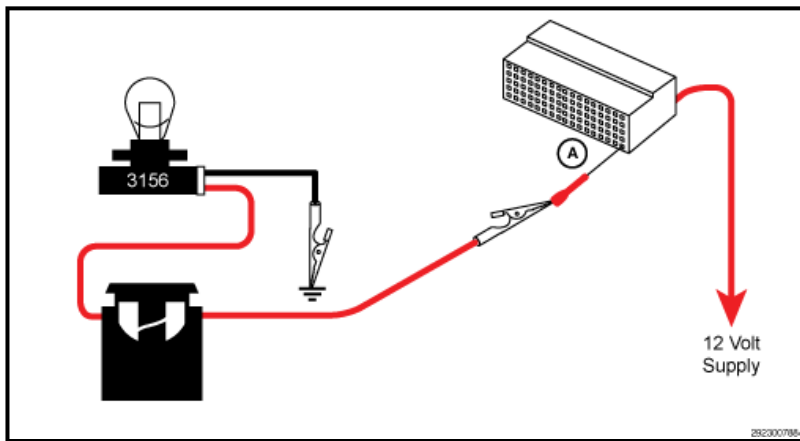
5. CHECK THE ASD SUPPLY (F343) CIRCUIT FOR OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

1. Turn the ignition off.
2. Disconnect the ASD C3 Supply harness connector.
3. Disconnect the Turbo Boost Actuator harness connector.

CAUTION: Do not load test any circuits with components still connected to the circuit.

4. Turn the ignition on.
5. Load test the ASD Supply (F343) circuit at the Turbo Boost Actuator harness connector. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [6](#)

No

- Repair the ASD Supply (F343) circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. ISOLATE AND CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PDC C3 harness connector and the Motor Boost Pressure Servo harness connector. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the Motor Boost Pressure Servo harness connector.
5. Connect the other lead to the PDC C3 harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Replace the Turbocharger Actuator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the (Z908) Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P00E9-00-INTAKE AIR TEMPERATURE SENSOR 1-3 PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor 3 is located at the Turbocharger before the Charge Air Cooler. It is sometimes referred to as the 'Charge Air Cooler Upstream Temperature' Sensor. This sensor monitors the air temperature prior to entering the Charge Air Cooler. The Powertrain Control Module illuminates the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Outlet Air Temperature Sensor Signal circuit is below a calibrated threshold for a calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
OUTLET AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
OUTLET AIR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO SIGNAL RETURN
OUTLET AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P00EA or P00EB active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE INLET AIR TEMPERATURE SENSOR FOR PROPER OPERATION

1. Turn the ignition on.
2. With the scan tool, erase all DTCs.
3. Turn the ignition off.
4. Disconnect the Inlet Air Temperature Sensor harness connector.
5. Turn the ignition on.

NOTE: With Inlet Air Temperature Sensor harness connector disconnected P00EB-INTAKE AIR TEMPERATURE 3 CIRCUIT HIGH should display as active or pending.

Did the scan tool display as described?

Yes

- Go To [5](#)

No

- Replace the Intake Air Temperature Sensor 3 in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P00EA-00-INTAKE AIR TEMPERATURE SENSOR 1-3 CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor 3 is located at the Turbocharger before the Charge Air Cooler. It is sometimes referred to as the 'Charge Air Cooler Upstream Temperature' Sensor. This sensor monitors the air temperature prior to entering the Charge Air Cooler. The Powertrain Control Module illuminates the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Inlet Air Temperature Signal circuit is below 1.1 Volts for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
INLET AIR TEMPERATURE SIGNAL SHORT TO GROUND
INLET AIR TEMPERATURE SIGNAL SHORT TO SENSOR RETURN CIRCUIT
INLET AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE INLET AIR TEMPERATURE (K69) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as

a guide to follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE INLET AIR TEMPERATURE (K69) SIGNAL CIRCUIT FOR A SHORT TO THE (K50) SENSOR GROUND CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE INLET AIR TEMPERATURE SENSOR FOR PROPER OPERATION

1. Replace the Inlet Air Temperature Sensor in accordance with the Service Information. Refer to **ENGINE SENSORS, REMOVAL AND INSTALLATION** .
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor 3 is located at the Turbocharger before the Charge Air Cooler. It is sometimes referred to as the 'Charge Air Cooler Upstream Temperature' Sensor. This sensor monitors the air temperature prior to entering the Charge Air Cooler. The Powertrain Control Module illuminates the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Inlet Air Temperature Signal circuit voltage is above a calibrated threshold for 2.0 seconds. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
INLET AIR TEMPERATURE SIGNAL CIRCUIT SHORT TO VOLTAGE
INLET AIR TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
INLET AIR TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE INLET AIR TEMPERATURE (K69) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: The voltage on a 5.0 volt signal or reference circuit should be between approximately 4.8 and 5.2 volts.

Is the voltage above 5.2 volts?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. ISOLATE AND CHECK THE INLET AIR TEMPERATURE (K69) SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

4. ISOLATE AND CHECK THE INLET AIR TEMPERATURE (K69) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the PCM connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE (K50) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the PCM connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE INLET AIR TEMPERATURE SENSOR FOR PROPER OPERATION

1. Replace the Inlet Air Temperature Sensor in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [7](#)

No

- Test complete.

- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P00F3-00-HUMIDITY SENSOR CIRCUIT PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The MAF sensor self reports there is an error in the humidity module temperature reading, or humidity module humidity reading.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, record all Freeze frame data and record any DTCs on the repair order.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Did the DTC reset?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P00F4 or P00F5 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To **3**

3. REPLACE THE MAF/INTAKE AIR SENSOR

1. Turn the ignition off.
2. Replace the MAF/Intake Air Sensor in accordance with the service information. Refer to **ENGINE SENSORS, REMOVAL AND INSTALLATION** .
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Start the engine and let it run for two minutes.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To **4**

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P00F4-00-HUMIDITY SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Pulse-Width Modulated (PWM) Humidity Signal is below 1.1 Volts for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HUMIDITY SIGNAL CIRCUIT SHORT TO GROUND
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Supply DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE HUMIDITY SENSOR (K648) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the engine off. Leave the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the Humidity Sensor (K648) Signal circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between ground and the Humidity Sensor (K648) Signal circuit at the MAF/Intake Air Sensor?

Yes

- Repair the Humidity Sensor (K648) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/INTAKE AIR SENSOR FOR PROPER OPERATION

1. Turn the ignition on.
2. With the scan tool check for PCM DTCs.

NOTE: With the connector unplugged the scan tool should display P00F5-00-HUMIDITY SENSOR CIRCUIT HIGH

3. While monitoring the scan tool, connect a jumper between the Intake Air Humidity Sensor (K648) Signal circuit and the (K757) Sensor Ground circuit in the MAF/Intake harness connector.

NOTE: With the jumper in place the scan tool should display P00F4-00-HUMIDITY SENSOR CIRCUIT LOW.

Did the DTCs display as described above?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P00F5-00-HUMIDITY SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Mass Air Flow/Intake Air Sensor Humidity Signal is above a calibrated voltage threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HUMIDITY SIGNAL CIRCUIT SHORT TO VOLTAGE
HUMIDITY SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE HUMIDITY SENSOR (K648) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the engine off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage on the Humidity Sensor (K648) Signal circuit at the MAF/Intake Air Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Humidity Sensor (K648) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE HUMIDITY SENSOR (K648) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PCM C1 harness connector.

3. Measure the resistance of the Humidity Sensor (K648) Signal circuit between the MAF/Intake Air Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Humidity Sensor (K648) Signal circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/ HUMIDITY SENSOR FOR PROPER OPERATION

1. Turn the ignition off for at least 10 seconds.
2. Turn the ignition on.
3. With the scan tool check for PCM DTCs.

NOTE: With the connector unplugged the scan tool should display P00F5-00-HUMIDITY SENSOR CIRCUIT HIGH.

4. While monitoring the scan tool, connect a jumper between the Intake Air Humidity Sensor (K648) Signal circuit and the Sensor (K757) Ground circuit in the MAF/Intake harness connector.

NOTE: With the jumper in place the scan tool should display P00F4-00-HUMIDITY SENSOR CIRCUIT LOW.

Did the DTCs display as described above?

Yes

- Go To [6](#)

No

- Replace the MAF/ Humidity Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P00F6-00-HUMIDITY SENSOR CIRCUIT INTERMITTENT/ERRATIC

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Mass Air Flow/Intake Air Sensor Humidity Signal circuit variation is considered erratic according to a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P00F4 or P00F5 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/ HUMIDITY SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the MAF Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool check for PCM DTCs.

NOTE:

With the connector unplugged the scan tool should display P00F5-00-HUMIDITY SENSOR CIRCUIT HIGH.

5. While monitoring the scan tool, connect a jumper between the Intake Air Humidity Sensor (K648) Signal circuit Sensor (K757) Ground circuit in the MAF/Intake harness connector.

NOTE: **With the jumper in place the scan tool should display P00F4-00-HUMIDITY SENSOR CIRCUIT LOW.**

Did the DTCs display as described above?

Yes

- Replace the MAF/ Humidity Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0101-00-MASS AIR FLOW SENSOR PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the Mass Air Flow Sensor Signal has exceeded it's minimum or maximum calibrated thresholds.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
AIR RESTRICTION
AIR LEAKS
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
MAF-INTAKE AIR SENSOR MAIN GROUND CIRCUIT OPEN/HIGH RESISTANCE
EGR VALVE
MASS AIR FLOW SENSOR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Sensor Reference voltage, MAF, Intake Air, Turbocharger, or EGR DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE AIR FILTER FOR PROPER AIR FLOW

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction

Were any of these problems found?

Yes

- Replace the Air Filter in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE AIR INTAKE SYSTEM FOR AIR RESTRICTIONS

NOTE: Inspect all air intake, crankcase vent and turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

1. Inspect the intake system, exhaust system and related tubes and connections.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE AIR INTAKE SYSTEM FOR AIR LEAKS

1. Remove the Inlet Pressure Sensor.
2. Connect smoke machine 84-04 to the Inlet Pressure Sensor port in the intake duct and begin injecting smoke into the intake system.
3. Observe all intake system components for evidence of smoke leakage.

Is there evidence of smoke leakage?

Yes

- Repair or replace as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE (F343) FUSED ASD RELAY CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the [CIRCUIT LOAD TESTING PROCEDURE](#) for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

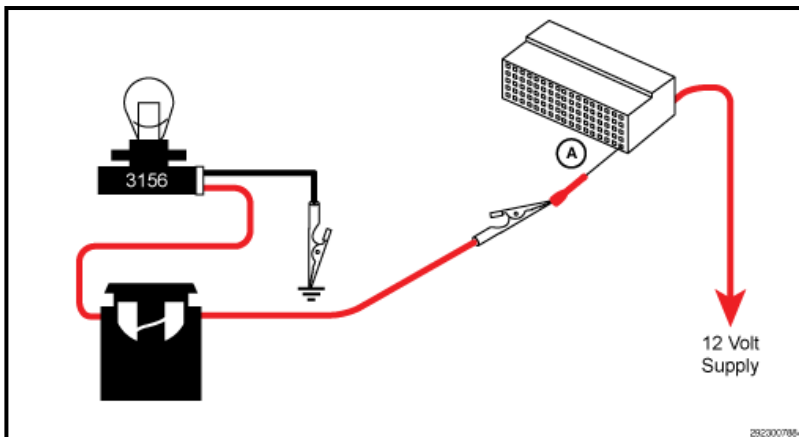
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

**NOTE:**

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (Z909) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

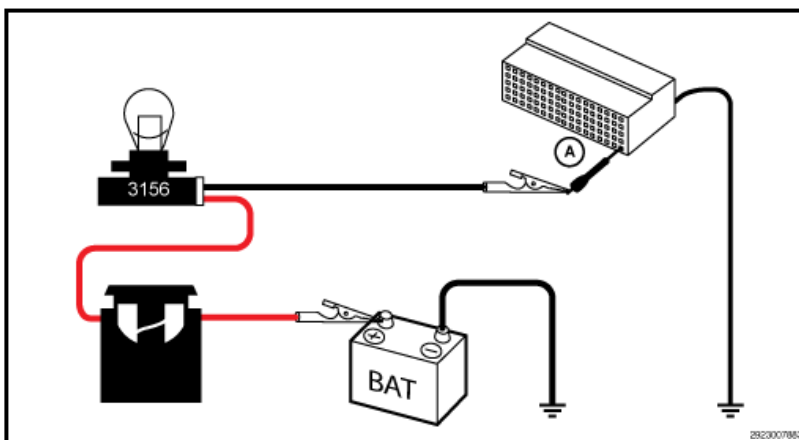
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [8](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE EGR VALVE FOR A STUCK OPEN CONDITION

NOTE: **An EGR Valve that is stuck partially open can cause this DTC to set. Hard starting, rough running and black smoke from the tailpipe are signs of an EGR Valve that is stuck open.**

1. While starting and test driving the vehicle, observe for the conditions mentioned in the note above.

Does the vehicle exhibit these conditions?

Yes

- Replace the EGR Valve in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Mass Air Flow Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0102-00-MASS AIR FLOW SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Mass Air Flow Sensor Signal is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE/EXHAUST SYSTEM PROBLEMS
MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO THE MASS AIR FLOW SENSOR GROUND CIRCUIT
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
MAF-INTAKE AIR SENSOR MAIN GROUND CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE INTAKE AND EXHAUST SYSTEM FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Inspect the exhaust system for damaged components that could cause exhaust flow blockage.

3. Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections for damage, air leaks or blockage.
4. Inspect the Charge Air Cooler hoses/tubes and connections for damage, air leaks or blockage.
5. Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE MAF SENSOR (K142) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the MAF Sensor (K142) Signal circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between ground and the MAF Sensor (K142) Signal circuit?

Yes

- Repair the Mass Air Flow Sensor (K142) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE MAF SENSOR (K142) SIGNAL CIRCUIT FOR A SHORT TO THE (K757) SENSOR GROUND CIRCUIT

1. Check for continuity between the MAF Sensor (K142) Signal circuit and the (K757) Sensor Ground circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between ground and the MAF Sensor (K142) Signal circuit and the (K757) Sensor Ground circuit?

Yes

- Repair the Mass Air Flow Sensor (K142) Signal circuit for a short to the (K757) Sensor Ground circuit.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the MAF harness connector.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the (F343) Fused ASD Relay Output circuit at the MAF harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the Fused ASD (F343) Relay Output circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

Turn the ignition off.

1. Disconnect the PCM C1 harness connector.
2. Load test the (Z908) Ground circuit at the MAF/Intake Air Sensor harness connector. **Note:** refer to the diagram below.

NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

3.

Is the load test bulb illuminated and bright?

Yes

- Go To [8](#)

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/INTAKE AIR SENSOR FOR PROPER OPERATION

1. Turn the ignition off for at least 10 seconds.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool check for PCM DTCs.

NOTE: With the connector unplugged the scan tool should display DTC P0103-00 MASS AIR FLOW SENSOR CIRCUIT HIGH.

5. While monitoring the scan tool, connect a jumper between the MAF Sensor (K142) Signal circuit and the Sensor (K757) Ground circuit in the MAF/Intake harness connector.

NOTE: With the jumper in place the scan tool should display DTC P0102-00
MASS AIR FLOW SENSOR CIRCUIT LOW.

Did the DTCs display as described above?

Yes

- Go To [9](#)

No

- Replace the MAF Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0103-00-MASS AIR FLOW SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- No reference Voltage DTCs present.

SET CONDITION

- The Mass Air Flow Sensor Signal is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
MASS AIR FLOW SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
MAF-INTAKE AIR SENSOR MAIN GROUND CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Sensor Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE MAF SENSOR (K142) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the MAF Sensor (K142) Signal circuit at the MAF/Intake Air Sensor harness connector.

Does the voltage measure above 5.2 volts?

Yes

- Repair the MAF Sensor (K142) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE MAF SENSOR (K142) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between the MAF Sensor (K142) Signal circuit between the MAF/Intake Air Sensor connector and the PCM C1 harness connector.

Is there continuity between ground and the MAF Sensor (K142) Signal circuit?

Yes

- Repair the MAF Sensor (K142) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (Z908) Sensor Ground circuit between the MAF/Intake Air Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (Z908) Sensor Ground circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE FUSED ASD (F343) RELAY OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition on.
2. Using a 12-volt test light connected to ground, probe the (F343) Fused ASD Relay Output circuit at the MAF harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the Fused ASD (F343) Relay Output circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

Turn the ignition off.

1. Disconnect the PCM C1 harness connector.
2. Load test the (Z908) Ground circuit at the MAF/Intake Air Sensor harness connector. **Note:** refer to the diagram below.

NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

3.

Is the load test bulb illuminated and bright?

Yes

- Go To [8](#)

No

- Repair the (Z908) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/INTAKE AIR SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool check for PCM DTCs.

NOTE: The DTC - P0103-00 MASS AIR FLOW SENSOR CIRCUIT HIGH should display as active or pending with the MAF/Intake Air Sensor harness connector disconnected.

5. While monitoring the scan tool, connect a jumper between the MAF Sensor (K142) Signal circuit and the Sensor (K757) Ground circuit in the MAF/Intake harness connector.

NOTE: With the jumper in place the scan tool should display DTC- P0102-00 MASS AIR FLOW SENSOR CIRCUIT LOW.

Does the scan tool display as described above?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0106-00-MANIFOLD ABSOLUTE PRESSURE SENSOR PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) rationalizes the intake manifold pressure by comparing the Boost Pressure Sensor input to the Barometric Pressure Sensor input. The Barometric Pressure Sensor is located internal to the PCM. The Boost Pressure Sensor is mounted on the Intake Manifold. It is sometimes called the 'TMAP'. This test runs at initial key on/prior to engine start, again after the engine is shutdown, and during after-run mode to determine the plausibility of these Sensors.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- No Sensor Reference DTCs present.
- No Barometer Sensor (BARO) DTCs present.

SET CONDITION

- The PCM detects a plausibility error between the Boost Pressure Sensor Signal and the BARO Pressure Sensor Signal.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
BOOST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs or are DTCs P0107 or P0108 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO MONITOR THE BOOST PRESSURE SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the Boost Pressure Sensor harness connector.
3. Turn the ignition on.

NOTE:

With the Boost Pressure Sensor harness connector disconnected P0108-00-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH DTC should set as active or pending.

4. With the scan tool check for PCM DTCs.

Does the scan tool display as described above?

Yes

- Replace the Boost Pressure Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0107-00-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) rationalizes the intake manifold pressure by comparing the Boost Pressure Sensor input to the Barometric Pressure Sensor input. The Barometric Pressure Sensor is located internal to the PCM. The Boost Pressure Sensor is mounted on the Intake Manifold. It is sometimes called the 'TMAP'. This test runs at initial key on/prior to engine start, again after the engine is shutdown, and during after-run mode to determine the plausibility of these Sensors.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on
- Battery voltage greater than 10.4 volts

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Manifold Absolute Pressure (MAP) Sensor input voltage is below 0.06 - 0.10 volts, depending on calibration, for approximately 0.08 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND
MAP SIGNAL CIRCUIT SHORTED TO GROUND
MAP SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE BOOST PRESSURE (K37) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.

2. Disconnect the PCM C2 harness connector.

3. Check for continuity between ground and the (K37) Boost Pressure Signal circuit at the Boost Pressure Sensor harness connector.

Is there continuity between ground and the (K37) Boost Pressure Signal circuit?

Yes

- Repair the Boost Pressure (K37) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK FOR THE BOOST PRESSURE (K37) SIGNAL CIRCUIT SHORTED TO THE (K690) SENSOR RETURN CIRCUIT

1. Check for continuity between the Boost Pressure (K37) Signal circuit and (K690) Sensor Return circuit at the Boost Pressure Sensor harness connector.

Is there continuity between the Boost Pressure (K37) Signal circuit and (K690) Sensor Return circuit?

Yes

- Repair the short between the Boost Pressure (K37) Signal circuit and (K690) Sensor Return circuit.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE BOOST PRESSURE (K37) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Boost Pressure (K37) Signal circuit between the Boost Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Boost Pressure (K37) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE ABILITY OF THE PCM TO READ THE BOOST PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the Boost Pressure Sensor harness connector.
3. Turn the ignition on.

NOTE: With the Boost Pressure Sensor harness connector disconnected DTC P0108-00 MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH should display.

With the scan tool, read DTCs.

Does the scan tool display as described above?

Yes

- Replace the Boost Pressure Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0108-00-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) rationalizes the intake manifold pressure by comparing the Boost Pressure Sensor input to the Barometric Pressure Sensor input. The Barometric Pressure Sensor is located internal to the PCM. The Boost Pressure Sensor is mounted on the Intake Manifold. It is sometimes called the 'TMAP'. This test runs at initial key on/prior to engine start, again after the engine is shutdown, and during after-run mode to determine the plausibility of these Sensors.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Boost Pressure (MAP) Sensor input voltage is above 4.88 - 4.92 volts depending on calibration for approximately 0.08 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.

POSSIBLE CAUSES

Possible Causes
BOOST PRESSURE SIGNAL CIRCUIT SHORT TO VOLTAGE
BOOST PRESSURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
BOOST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [4](#)

3. CHECK THE BOOST PRESSURE SENSOR CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the Boost Pressure Sensor harness connector for proper connection at the Boost Pressure Sensor.
3. Verify that the connector is completely plugged in and properly locked prior to disconnecting.
4. Disconnect the Boost Pressure Sensor harness connector and check for any pushed out, damaged or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the damaged terminal or properly connect and lock the MAP Sensor harness connector and retest for DTCs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE BOOST PRESSURE SENSOR (K37) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Boost Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Boost Pressure Sensor (K37) Signal circuit at the Boost Pressure Sensor harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Boost Pressure Sensor (K37) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK FOR THE BOOST PRESSURE SENSOR (K37) SIGNAL CIRCUIT SHORTED TO THE (K668) 5-VOLT SUPPLY CIRCUIT

1. Disconnect the PCM C2 harness connector.
2. Check for continuity between the Boost Pressure (K37) Signal circuit and the (K668) 5-Volt Supply at the Boost Pressure Sensor harness connector.

Is there continuity between the Boost Pressure Sensor (K37) Signal circuit and the (K668) 5-Volt Supply?

Yes

- Repair the Boost Pressure Sensor (K37) Signal circuit for a short to the (K668) 5-Volt Supply circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE BOOST PRESSURE SENSOR (K37) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C2 harness connector.
2. Measure the resistance of the Boost Pressure Sensor (K37) Signal circuit between the Boost Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the Boost Pressure Sensor (K37) Signal circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE (K690) SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K690) Sensor Return circuit between the Boost Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the (K690) Sensor Return circuit for a open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE ABILITY OF THE PCM TO READ THE BOOST PRESSURE SENSOR

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between the (K690) Sensor Return circuit and the Boost Pressure Sensor (K37) Signal circuit at the Boost Pressure Sensor harness connector.
3. Turn the ignition on.

NOTE: The P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW DTC should display as active or pending with the jumper in place.

4. With the scan tool, read DTCs.

Does the scan tool display as described above?

Yes

- Replace the Boost Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0110-00-INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor rationality diagnostic looks at the outputs of three temperature sensors and compares them under cold start conditions. Following a start to run delay time the outputs of the Ambient Air Temperature (AAT) Sensor, Engine Coolant Temperature (ECT) Sensor, and Intake Air Temperature (IAT) Sensors will be compared. If the ECT and AAT Sensors agree and the IAT Sensor does not agree, the IAT Sensor is declared as irrational. If declared irrational a second comparison will be done after a short drive cycle.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- This DTC will set due to a general LIN Bus signal error related to the Mass Air Flow (MAF) Sensor.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW (MAF) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE (D509) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. REPLACE THE MASS AIR FLOW (MAF) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0111-00-INTAKE AIR TEMPERATURE SENSOR 1 PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor rationality diagnostic looks at the outputs of three temperature sensors and compares them under cold start conditions. Following a start to run delay time the outputs of the Ambient Air Temperature (AAT) Sensor, Engine Coolant Temperature (ECT) Sensor, and Intake Air Temperature (IAT) Sensors will be compared. If the ECT and AAT Sensors agree and the IAT Sensor does not agree, the IAT Sensor is declared as irrational. If declared irrational a second comparison will be done after a short drive cycle.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- After an engine off time of greater than 480 minutes.
- At ignition on the:
 - Ambient temperature reading is greater than -64°C (-83.2°F).
 - Engine coolant temperature reading is greater than -64°C (-83.2°F).
 - Intake air temperature reading is greater than -64°C (-83.2°F).
- After the engine is started and the vehicle is driven above 48.3 km/h (30 mph) for 30 seconds a determination is made.

SET CONDITION

- The Powertrain Control Module (PCM) compares the Ambient Air Temperature (AAT), Engine Coolant Temperature (ECT), and Intake Air Temperature (IAT) Sensor values. If one sensor values is not within approximately 10°C (18°F) of the other temperature sensors for two consecutive trips, a DTC will set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AMBIENT AIR TEMPERATURE (AAT)
ENGINE COOLANT TEMPERATURE (ECT)
MASS AIR FLOW (MAF) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are AAT or ECT DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. REPLACE THE MAF/INTAKE AIR SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information. Refer to [ENGINE SENSORS, REMOVAL AND INSTALLATION](#) .
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCS.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0112-00-INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor is a variable resistor that functions as a normal two wire, 5-Volt sensor. The Powertrain Control Module (PCM) supplies the IAT Sensor with a 5-Volt signal and a filtered ground (return) circuit. For the IAT Sensor diagnostic, the PCM internally monitors the voltage on the signal circuit, which is converted into a temperature reading. If the voltage reads above the high calibrated threshold, or below the low calibrated threshold, a circuit high or low fault is set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Intake Air Temperature Signal circuit voltage is below a calibrated threshold for 1.5 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE AIR TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
INTAKE AIR TEMPERATURE SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ABILITY OF THE PCM TO READ THE IAT SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the IAT Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs and record on the repair order.

NOTE: The **P0113-INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH** DTC should display as active or pending with the connector disconnected.

Does the scan tool display as described above?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE (K362) INTAKE AIR TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between ground and the (K362) Intake Air Temperature Signal circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between ground and the (K362) Intake Air Temperature Signal circuit?

Yes

- Repair the (K362) Intake Air Temperature Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK FOR THE INTAKE AIR TEMPERATURE (K362) SIGNAL CIRCUIT SHORTED TO THE (K757) SENSOR GROUND CIRCUIT

1. Check for continuity between the Intake Air Temperature (K362) Signal circuit and the (K757) Sensor Ground circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between the Intake Air Temperature (K362) Signal circuit and the (K757) Sensor Ground circuit?

Yes

- Repair the Intake Air Temperature (K362) Signal circuit for a short to the (K757) Sensor Ground circuit.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0113-00-INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Intake Air Temperature (IAT) Sensor is a variable resistor that functions as a normal two wire, 5-Volt sensor. The Powertrain Control Module (PCM) supplies the IAT Sensor with a 5-Volt signal and a filtered ground (return) circuit. For the IAT Sensor diagnostic, the PCM internally monitors the voltage on the signal circuit, which is converted into a temperature reading. If the voltage reads above the high calibrated threshold, or below the low calibrated threshold, a circuit high or low fault is set.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Air Temperature (IAT) Sensor input voltage is above 4.9 - 4.95 volts depending on calibration for 2.24 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

POSSIBLE CAUSES
IAT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
IAT SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
IAT SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
INTAKE AIR TEMPERATURE (IAT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE IAT SENSOR CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the IAT Sensor harness connector for proper connection at the IAT Sensor.
3. Verify that the connector is completely plugged in and properly locked prior to disconnecting.
4. Disconnect the IAT Sensor harness connector and check for any pushed out, damaged or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the damaged terminal or properly connect and lock the IAT Sensor harness connector and retest for DTCs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE (K362) INTAKE AIR TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition on.
2. Measure the voltage on the (K362) Intake Air Temperature Signal circuit at the MAF/Intake Air Sensor harness connector.

Does the voltage measure above 5.2 volts?

Yes

- Repair the (K362) Intake Air Temperature Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE INTAKE AIR TEMPERATURE (K362) SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the (K362) Intake Air Temperature Signal circuit between the MAF/Intake Air Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Intake Air Temperature (K362) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (K757) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K757) Sensor Ground circuit between the MAF/Intake Air Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (K757) Sensor Ground circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE ABILITY OF THE PCM TO READ THE MAF/INTAKE AIR SENSOR

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Connect a fused jumper wire between the (K757) MAF/Intake Air Sensor Ground circuit and the (K362) Intake Air Temperature Signal circuit at the MAF/Intake Air Sensor harness connector.

4. Turn the ignition on.
5. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0112-00-Intake Air Temperature Sensor Low DTC as active or pending with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Mass Air Flow/Intake Air Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0116-00-ENGINE COOLANT TEMPERATURE SENSOR 1 PERFORMANCE

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The cooling system of the modern internal combustion engine has two main functions. The first function is to keep the engine from overheating once the engine is at operating temperatures. This is achieved by keeping the cylinder head cool to eliminate pre-ignition and the cylinder block warmer for decreased friction. The secondary function is to increase the engine temperature rapidly to eliminate high friction at cold temperatures and increase cabin heat, more rapidly, for the vehicle occupant comfort. The temperature of the coolant fluid is monitored by the Powertrain Control Module (PCM) using the engine coolant temperature sensor. The PCM checks rationality of this data by comparing the received data to other temperature sensors on the engine, such as the Engine Oil Temperature (EOT) sensor.

The Engine Coolant Temperature (ECT) Sensor operates as a typical two wire sensor. It receives a 5-Volt signal on the ECT Sensor Signal circuit and is grounded through the Coolant Temperature Sensor Return circuit. It acts as a variable resistor, and changes resistance as temperature changes.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Engine off time is greater than 480 minutes.
- Ambient temperature is greater than -64°C (-83°F).
- Intake air temperature is greater than -64°C (-83°F).
- Engine coolant temperature is greater than -64°C (-83°F).
- Vehicle speed is above 30-35 mph for 30 seconds to one minute depending on calibrated values.
 - Once the vehicle is soaked for a calibrated engine off time and then driven over the calibrated speed and load conditions for a calibrated time, the PCM compares the Ambient, Engine Coolant and Intake Air Temperature Sensor values.

SET CONDITION

- If Ambient Air and Intake Air Temperature Sensors are within 15°C (27°F) of each other and Engine Coolant Temperature Sensor within 15°C (27°F) of the others, the Engine Coolant Temperature Sensor signal is declared as irrational.

NOTE: The fail values will increase if a block heater is detected.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ECT SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
ECT SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE CONDITION

1. Turn the ignition off.
2. Allow the vehicle to sit with the ignition off in an environment where the temperature is consistent and above -64°C (83.2°F) until the engine coolant temperature is equal to, or close to the environmental ambient temperature.
3. Turn the ignition on.
4. With a scan tool, compare the ECT, AAT, and IAT Sensor values.

Is the Engine Coolant Temperature Sensor value within 15°C (27°F) of the other two sensor values?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

No

- Go To [2](#)

2. CHECK THE ECT SENSOR CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the ECT Sensor harness connector for proper connection at the ECT Sensor.
3. Verify that the connector is completely plugged in and properly locked prior to disconnecting.
4. Disconnect the ECT Sensor harness connector and check for any pushed out, damaged or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the damaged terminal or properly connect and lock the ECT Sensor harness connector and retest for DTCs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK FOR THE HIGH RESISTANCE IN THE ECT SENSOR (K2) SIGNAL CIRCUIT

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the ECT Sensor (K2) Signal circuit between the ECT Sensor harness connector and the PCM C1 connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the ECT Sensor (K2) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK FOR HIGH RESISTANCE IN THE (K200) SENSOR GROUND CIRCUIT

1. Measure the resistance of the (K200) Sensor Ground circuit between the ECT Sensor harness connector and the PCM.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K200) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK THE ABILITY OF THE PCM TO READ THE ECT SENSOR SIGNAL

1. Disconnect the Engine Coolant Temperature Sensor harness connector.
2. With the scan tool, read DTCs.

NOTE: **The scan tool should display a P0118-Engine Coolant Temperature Sensor High DTC as active with the connector disconnected.**

3. Connect a jumper between the ECT Sensor (K2) Signal circuit and the (K200) Sensor ground circuit at the ECT harness connector.

NOTE: **The P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW DTC should be active or pending with the jumper in place.**

Does the scan tool display the DTCs as described above?

Yes

- Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0117-00-ENGINE COOLANT TEMPERATURE SENSOR 1 CIRCUIT LOW

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The cooling system of the modern internal combustion engine has two main functions. The first function is to keep the engine from overheating once the engine is at operating temperatures. This is achieved by keeping the cylinder head cool to eliminate pre-ignition and the cylinder block warmer for decreased friction. The secondary function is to increase the engine temperature rapidly to eliminate high friction at cold temperatures and increase cabin heat, more rapidly, for the vehicle occupant comfort. The temperature of the coolant fluid is monitored by the Powertrain Control Module (PCM) using the engine coolant temperature sensor. The PCM checks rationality of this data by comparing the received data to other temperature sensors on the engine, such as the Engine Oil Temperature (EOT) sensor.

The Engine Coolant Temperature (ECT) Sensor operates as a typical two wire sensor. It receives a 5-Volt signal on the ECT Sensor Signal circuit and is grounded through the Coolant Temperature Sensor Return circuit. It acts as a variable resistor, and changes resistance as temperature changes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Engine Coolant Temperature (ECT) Sensor input voltage is below 0.25 - 0.3 volts depending on calibration for 2.24 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- The ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
ECT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECT SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ABILITY OF THE PCM TO READ THE ECT SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the ECT Sensor harness connector.

3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The **P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH DTC** should be active or pending with the connector unplugged.

Does the scan tool display as described above?

Yes

- Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **3**

3. CHECK THE ENGINE COOLANT TEMPERATURE SENSOR (K2) SIGNAL CIRCUIT FOR A SHORT TO GROUND

- 1.
2. Turn the ignition off.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and the Engine Coolant Temperature Sensor (K2) Signal circuit at the Engine Coolant Temperature Sensor harness connector.

Is there continuity between ground and the Engine Coolant Temperature Sensor (K2) Signal circuit ?

Yes

- Repair the Engine Coolant Temperature Sensor (K2) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **4**

4. CHECK THE ENGINE COOLANT TEMPERATURE SENSOR (K2) SIGNAL CIRCUIT FOR A SHORT TO THE (K200) SENSOR GROUND CIRCUIT

- 1.
2. Check for continuity between the Engine Coolant Temperature Sensor (K2) Signal circuit and the (K200) Sensor Ground circuit at the Engine Coolant Temperature Sensor harness connector.

Is there continuity between ground and the Engine Coolant Temperature Sensor (K2) Signal circuit and the (K200) Sensor Ground circuit?

Yes

- Repair the Engine Coolant Temperature Sensor (K2) Signal circuit for a short to the (K200) Sensor Ground circuit.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **5**

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The cooling system of the modern internal combustion engine has two main functions. The first function is to keep the engine from overheating once the engine is at operating temperatures. This is achieved by keeping the cylinder head cool to eliminate pre-ignition and the cylinder block warmer for decreased friction. The

secondary function is to increase the engine temperature rapidly to eliminate high friction at cold temperatures and increase cabin heat, more rapidly, for the vehicle occupant comfort. The temperature of the coolant fluid is monitored by the Powertrain Control Module (PCM) using the engine coolant temperature sensor. The PCM checks rationality of this data by comparing the received data to other temperature sensors on the engine, such as the Engine Oil Temperature (EOT) sensor.

The Engine Coolant Temperature (ECT) Sensor operates as a typical two wire sensor. It receives a 5-Volt signal on the ECT Sensor Signal circuit and is grounded through the Coolant Temperature Sensor Return circuit. It acts as a variable resistor, and changes resistance as temperature changes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Engine Coolant Temperature (ECT) Sensor input voltage is above 4.95 volts depending on calibration for 2.24 seconds.

DEFAULT ACTION

- The ETC light will illuminate.
- The MIL will illuminate.
- The Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
ECT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECT SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.
- Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE ECT SENSOR CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the ECT Sensor harness connector for proper connection at the ECT Sensor.
3. Verify that the connector is completely plugged in and properly locked prior to disconnecting.
4. Disconnect the ECT Sensor harness connector and check for any pushed out, damaged or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the damaged terminal or properly connect and lock the ECT Sensor harness connector and retest for DTCs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To

3. CHECK THE ENGINE COOLANT TEMPERATURE SENSOR (K2) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the Engine Coolant Temperature Sensor harness connector.
2. Measure the voltage on the (K2) Engine Coolant Temperature Sensor Signal circuit in the Engine Coolant Temperature Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Engine Coolant Temperature Sensor (K2) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE ENGINE COOLANT TEMPERATURE SENSOR (K2) SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the Engine Coolant Temperature Sensor (K2) Signal circuit between the Engine Coolant Temperature Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Engine Coolant Temperature Sensor (K2) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE (K200) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1.

2. Measure the resistance of the (K200) Sensor Ground circuit between the Engine Coolant Temperature Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (K200) Sensor Ground circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE ABILITY OF THE PCM TO READ THE ECT SENSOR SIGNAL

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Turn the ignition off.
4. Connect the PCM C2 harness connector.
5. Connect a jumper wire between the (K200) Sensor Ground circuit and the Engine Coolant Temperature Sensor (K2) Signal circuit in the Engine Coolant Temperature Sensor harness connector.
6. Turn the ignition on.
7. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW DTC as active with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

NOTE: Remove the jumper before continuing.

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0122-00-THROTTLE POSITION SENSOR 1 CIRCUIT LOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Accelerator Pedal Position (APP) signal circuit.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
APP 1 SIGNAL CIRCUIT SHORTED TO GROUND
APP 2 SIGNAL CIRCUIT SHORTED TO GROUND
ACCELERATOR PEDAL POSITION (APP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE APP SENSOR (K23) SIGNAL 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE APP SENSOR (K29) SIGNAL 2 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE ACCELERATOR PEDAL POSITION (APP) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.

3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P24DA-00 To U0164-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P24DA-00-PARTICULATE MATTER SENSOR EXHAUST SAMPLE ERROR BANK 1

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The Engine is started and running after a 4-hour Engine-Off period.
- Until the Engine operating temperature rises above 82B°C (180B°F).

SET CONDITION

- The Particulate Matter (PM) Sensor reports an internal wiring failure to the PCM. The PCM detects that the filtered exhaust volume flow is greater than a calibrated threshold and the heater duty cycle times the sensor supply voltage is also below a calibrated limit. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.

NOTE: Do Not cycle the ignition during this Test Step. If the ignition is cycled off too often, the PCM will place this monitor in sleep mode for at least 4 hours. Erasing the DTC, leaving the ignition on, and then starting the Engine will satisfy the 'Two Trip' requirement for re-starting this monitor.

4. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE PM SENSOR OPERATION

The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the PM Sensor (Module) and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.

5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the PM Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24F2-00-EGR TEMPERATURE/CHARGE AIR COOLER TEMPERATURE CORRELATION

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the absolute difference between the EGR temperature Sensor and the Charge Air Cooler Temperature Sensor is higher than a calibrated value for a calibrated amount of time.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR TEMPERATURE SENSOR
CHARGE AIR COOLER TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Charge Air Cooler Temperature or EGR Temperature Sensor-related DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO READ THE EGR TEMPERATURE SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the EGR Temperature Sensor harness connector.
3. Turn the ignition on.
4. While monitoring the scan tool, connect a jumper between the (K915) Sensor Return circuit and the (K935) EGR Temperature Signal circuit at the EGR Temperature Sensor harness connector.

Did the P040C DTC set this the jumper wire connected?

Yes

- Replace the EGR Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P24F3-00-REDUCTANT TANK TEMPERATURE/FUEL TEMPERATURE CORRELATION

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the absolute difference between the Fuel temperature Sensor and the Diesel Exhaust Fluid (DEF) Temperature Sensor is higher than a calibrated value for a 4.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL TEMPERATURE SENSOR
DEF TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Reductant Temperature-related or Fuel Temperature Sensor-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO READ THE FUEL TEMPERATURE SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the Fuel Temperature Sensor harness connector.
3. Turn the ignition on.
4. While monitoring the scan tool, connect a jumper between the (K159) Sensor Return circuit and the Fuel Temperature (K156) Signal circuit at the Fuel Temperature Sensor harness connector.

Did the P0182 DTC set?

Yes

- Replace the Fuel Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2505-00-ECM-PCM POWER INPUT SIGNAL

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the power supply for the PCM is below a calibrated threshold.

DEFAULT ACTION

- The MIL will not illuminate

POSSIBLE CAUSES

Possible Causes
PDC FUSE(S) AND/OR RELAY(S) FAULTY IGNITION SWITCH POWER DISTRIBUTION CENTER (PDC)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK ALL FUSES AND RELAYS IN THE PDC

1. Check all fuses and relays in the PDC.

Are there any open fuses or non-functioning relays found?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .
- If a fuse is found to be open or a relay is found to not be functioning, replace the fuse or relay and retest.

No

- Go To [4](#)

4. CHECK POWER SUPPLIES AND GROUNDS FOR THE PCM

1. Turn the ignition off.
2. Remove the PCM harness connectors at the PCM.
3. Using the appropriate wiring diagrams check the power supplies and grounds at the PCM harness connector.

NOTE: Use the appropriate wiring diagram to determine what circuits are powered with the ignition on and off, then test accordingly using the special tools shown below.

4. (special tool #2064100080, Kit, Electrical Test Lead)

Are there any circuit issues present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [5](#)

5. REPLACE THE POWER DISTRIBUTION CENTER (PDC) AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the PDC in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty PDC repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2564-00-TURBOCHARGER POSITION SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Turbocharger Boost Control Position Sensor is used to indicate the position of the turbine vanes. The Position Sensor is located inside the actuator assembly at the end of the output shaft that is used to position the vanes. The output shaft angle, as indicated by the Position Sensor, is sent via CAN message from the actuator to the Powertrain Control Module (PCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Sensor reference DTCs not present.

SET CONDITION

- The PCM detects that the Turbocharger Position Sensor Signal is below or above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
TURBOCHARGER BOOST ACTUATOR FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Monitor the scan tool for at least two minutes.
5. Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Turbocharger DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE FUSED IGNITION (F343) OUTPUT CIRCUIT AND THE (Z908) GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Turbocharger Boost Actuator harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F343) Output circuit and the (Z908) Ground circuit at the Turbocharger Boost Actuator harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [4](#)

No

- Repair the Fused Ignition (F343) Output circuit for an open or short to ground, or check the (Z908) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE TURBOCHARGER BOOST ACTUATOR OPERATION

NOTE: The Turbocharger Boost Actuator may or may not be serviced separately from the Turbocharger. Consult the STAR Parts Catalog.

1. Replace the Turbocharger Boost Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Test drive the vehicle
6. Using the scan tool, monitor for DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Turbocharger Boost Actuator repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2565-00-TURBOCHARGER POSITION SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Turbocharger Boost Control Position Sensor is used to indicate the position of the turbine vanes. The Position Sensor is located inside the actuator assembly at the end of the output shaft that is used to position the vanes. The output shaft angle, as indicated by the Position Sensor, is sent via CAN message from the actuator to the Powertrain Control Module (PCM).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Sensor reference DTCs not present.

SET CONDITION

- The PCM detects that the Turbocharger Position Sensor Signal is below or above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
TURBOCHARGER BOOST ACTUATOR FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Monitor the scan tool for at least two minutes.
5. Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Turbocharger DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE FUSED IGNITION (F343) OUTPUT CIRCUIT AND THE (Z908) GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Turbocharger Boost Actuator harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F343) Output circuit and the (Z908) Ground circuit at the Turbocharger Boost Actuator harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [4](#)

No

- Repair the Fused Ignition (F343) Output circuit for an open or short to ground, or check the (Z908) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE TURBOCHARGER BOOST ACTUATOR OPERATION

NOTE: The Turbocharger Boost Actuator may or may not be serviced separately from the Turbocharger. Consult the STAR Parts Catalog.

1. Replace the Turbocharger Boost Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Test drive the vehicle
6. Using the scan tool, monitor for DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Turbocharger Boost Actuator repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P257D-00-ENGINE HOOD SWITCH 1 CIRCUIT PERFORMANCE

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the hood ajar status of both hood ajar switches on Plug-in Hybrid Electric Vehicles (PHEV) and Electronic Stop/Start (ESS) equipped vehicles for proper operation. Hood Ajar Switch 1 is hard-wired to the Body Control Module (BCM). The signal is sent to the PCM over the CAN Bus. Hood Ajar Switch 2 is hard-wired to the PCM. If the PCM detects that either switch is in the open position or is faulted for any reason during a normal drive cycle, ESS will be disabled for the remainder of the drive cycle. This condition will cause the engine to default to a running state on both PHEV and ESS equipped vehicles. If Hood Ajar Switch 2 is faulted or in the open state it will also cause the Remote Start feature to be inoperative.

For additional information on the effect of this DTC to the operation of ESS, proceed to the **ENGINE START/STOP (ESS) INOPERATIVE**. . Refer to [**ENGINE STOP/START \(ESS\) SYSTEM INOPERATIVE**](#) .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive the Hood Ajar Switch 1 message over the CAN BUS from the BCM.

DEFAULT ACTION

- The Hood Ajar Lamp will illuminate.
- This is a non-MIL fault.

- ESS is disabled while the DTC is present.
- The engine will start if not running when DTC sets.

POSSIBLE CAUSES

Possible Causes
HOOD AJAR SWITCH WIRING ISSUE
HOOD AJAR SWITCH
BODY CONTROL MODULE (BCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. VERIFY THAT THE BODY CONTROL MODULE IS CAPABLE OF SETTING HOOD AJAR SWITCH FAULTS

1. Check the BCM fault code list to verify that the BCM has the capability to set DTCs against the Hood Ajar Switch. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX**.

Are there any Hood Ajar Switch faults listed in the DTC list for the BCM?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE BODY CONTROL MODULE FOR HOOD AJAR SWITCH FAULTS

1. With the scan tool, read DTCs in the BCM.

Is the BCM setting any DTCs against the Hood Ajar Switch?

Yes

- Perform the diagnostic procedure in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Replace and program the Body Control Module (BCM) in accordance with the Service Information.

4. CHECK THE HOOD AJAR SWITCH 1 CONNECTOR AND TERMINALS

1. Turn the ignition off.
2. Check the Hood Ajar Switch 1 harness connector for proper connection at the Hood Latch Assembly.
3. Verify that the connector is completely plugged in and properly locked prior to disconnecting.
4. Disconnect the Hood Ajar Switch 1 harness connector and check for any pushed out, damaged or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the damaged terminal or properly connect and lock the Hood Ajar Switch 1 harness connector and retest for DTCs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE HOOD AJAR SWITCH 1 FOR PROPER FUNCTION

1. Check the Hood Ajar Switch 1 functionality. Use the Hood Ajar Switch 1 diagnostic and technical information provided above.

Is the Hood Ajar Switch 1 functioning properly?

Yes

- Go To [6](#)

No

- Replace the Hood Latch Assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK THE HOOD AJAR SWITCH WIRING FOR AN OPEN OR SHORTED CONDITION

1. Disconnect the appropriate BCM harness connector.
2. Check the Hood Ajar Switch wiring:
 - For an open condition.
 - For a short to voltage.
 - For a short to ground.
 - For a short to each other.

Were any problems found with the wiring?

Yes

- Perform the appropriate wiring repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK RELATED BCM AND COMPONENT CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Body Control Module (BCM) in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the hood ajar status of both hood ajar switches on Plug-in Hybrid Electric Vehicles (PHEV) and Electronic Stop/Start (ESS) equipped vehicles for proper operation. Hood Ajar Switch 1 is hard-wired to the Body Control Module (BCM). The signal is sent to the PCM over the CAN Bus. Hood Ajar Switch 2 is hard-wired to the PCM. If the PCM detects that either switch is in the open position or is faulted for any reason during a normal drive cycle, ESS will be disabled for the remainder of the drive cycle. This condition will cause the engine to default to a running state on both PHEV and ESS equipped vehicles. If Hood Ajar Switch 2 is faulted or in the open state it will also cause the Remote Start feature to be inoperative.

For additional information on the effect of this DTC to the operation of ESS, proceed to the **ENGINE START/STOP (ESS) INOPERATIVE**. . Refer to **ENGINE STOP/START (ESS) SYSTEM INOPERATIVE** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on and Electric Stop/Start (ESS) is enabled.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Hood Ajar Switch voltage is below a calibrated threshold for calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HOOD AJAR SWITCH 2 SIGNAL CIRCUIT SHORT TO GROUND
HOOD AJAR SWITCH SENSE CIRCUIT SHORT TO GROUND
HOOD AJAR SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Start the engine and test drive the vehicle with Start/Stop enabled.
2. With the scan tool, view PCM DTCs.

Is the DTC active?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Hood Ajar Switch (Hood Latch) harness connector.
3. Disconnect the BCM harness connector A.
4. Measure the resistance between ground and the Hood Ajar Switch (G70) Sense circuit at the BCM harness connector A.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Engine Hood Switch (G70) Sense Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE ENGINE HOOD SWITCH 2 (K806) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the PCM C2 harness connector.
2. Measure the resistance between ground and the Engine Hood Switch 2 (K806) Signal circuit at the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Engine Hood 2 (K806) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE HOOD AJAR SWITCH OPERATION

1. Depress the plunger of the hood ajar switch and measure the resistance between the two terminals of the switch.

Is the resistance approximately 1000 Ohms?

Yes

- Go To [5](#)

No

- Replace the Hood Ajar Switch in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the BCM in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

P257F-00-ENGINE HOOD SWITCH 1 CIRCUIT HIGH

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the hood ajar status of both hood ajar switches on Plug-in Hybrid Electric Vehicles (PHEV) and Electronic Stop/Start (ESS) equipped vehicles for proper operation. Hood Ajar Switch 1 is hard-wired to the Body Control Module (BCM). The signal is sent to the PCM over the CAN Bus. Hood Ajar Switch 2 is hard-wired to the PCM. If the PCM detects that either switch is in the open position or is faulted for any reason during a normal drive cycle, ESS will be disabled for the remainder of the drive cycle. This condition will cause the engine to default to a running state on both PHEV and ESS equipped vehicles. If Hood Ajar Switch 2 is faulted or in the open state it will also cause the Remote Start feature to be inoperative.

For additional information on the effect of this DTC to the operation of ESS, proceed to the **ENGINE START/STOP (ESS) INOPERATIVE**. . Refer to **ENGINE STOP/START (ESS) SYSTEM INOPERATIVE** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on and Electric Stop/Start (ESS) is enabled.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Hood Ajar Switch voltage received over the CAN BUS from the BCM is above 4.9 volts for 0.32 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HOOD AJAR SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE
HOOD AJAR SWITCH SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
HOOD AJAR SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Start the engine and test drive the vehicle with Start/Stop enabled.
2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Hood Ajar Switch (Hood Latch) harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Hood Ajar Switch (G70) Sense circuit at the Hood Ajar Switch harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Engine Hood Ajar Switch (G70) Sense circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the BCM harness connector A.
3. Measure the resistance of the Hood Ajar Switch (G70) Sense circuit between the Hood Ajar Switch harness connector and the BCM harness connector A.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Hood Ajar Switch (G70) Sense circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE (G931) SENSOR GROUND CIRCUIT FOR AN OPEN

1. Measure the resistance of the (G931) Sensor Ground circuit between the Hood Ajar Switch harness connector and the BCM harness connector A.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (G931) Sensor Ground circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE HOOD AJAR SWITCH OPERATION

1. Depress the plunger of the hood ajar switch and measure the resistance between the two terminals of the switch.

Is the resistance approximately 1000 Ohms?

Yes

- Go To [6](#)

No

- Replace the Hood Ajar Switch in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the BCM in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Start the engine and test drive the vehicle with Start/Stop enabled.
2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Hood Ajar Switch (Hood Latch) harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Hood Ajar Switch (G70) Sense circuit at the Hood Ajar Switch harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Engine Hood Ajar Switch (G70) Sense circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the BCM harness connector A.
3. Measure the resistance of the Hood Ajar Switch (G70) Sense circuit between the Hood Ajar Switch harness connector and the BCM harness connector A.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Hood Ajar Switch (G70) Sense circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE (G931) SENSOR GROUND CIRCUIT FOR AN OPEN

1. Measure the resistance of the (G931) Sensor Ground circuit between the Hood Ajar Switch harness connector and the BCM harness connector A.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (G931) Sensor Ground circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK THE HOOD AJAR SWITCH OPERATION

1. Depress the plunger of the hood ajar switch and measure the resistance between the two terminals of the switch.

Is the resistance approximately 1000 Ohms?

Yes

- Go To [6](#)

No

- Replace the Hood Ajar Switch in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the BCM in accordance with the Service Information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

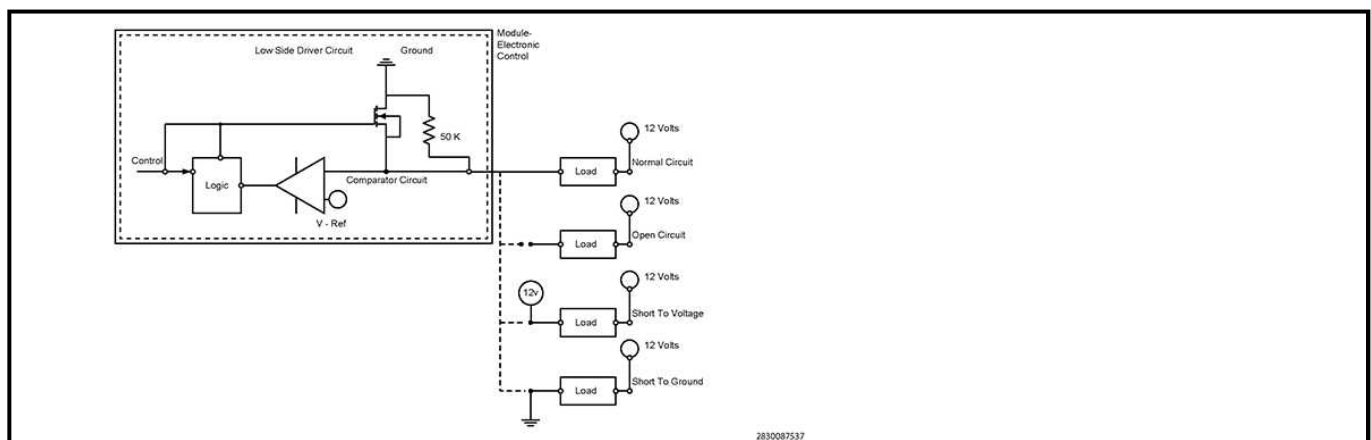
THEORY OF OPERATION

The Electric Vacuum Pump (EVP) system is installed to provide supplemental vacuum to the brake booster, when the engine vacuum supply is low. The pump is connected to the engine and the brake booster through a series of hoses and one-way flow check valves. A pressure sensor, mounted in the brake booster, provides information to the ABS/ESP Module. This information is then sent to the Powertrain Control Module (PCM) over the CAN C BUS. The PCM modulates the EVP operation to maintain the brake booster vacuum within a given range. This system ensures that the customer experiences a consistent brake pedal feel under all driving conditions. Both Vacuum Pump Relays are controlled by the PCM through the use of an internal Low Side Driver (LSD) Control.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With ignition on.
- Battery voltage above 10.0 Volts.

SET CONDITION

- The actual EVP state is not equal to the desired EVP state. One Trip Fault.

DEFAULT ACTION

- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.
- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
FUSED RUN/ START CIRCUIT OPEN/HIGH RESISTANCE
EVP SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
EVP GROUND CIRCUIT OPEN/HIGH RESISTANCE
EVP SUPPLY CIRCUIT SHORTED TO GROUND
ELECTRIC VACUUM PUMP (EVP) RELAY
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P258C-00 or P258D-00 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE FUSED RUN/ START CIRCUIT

1. Turn the ignition off.
2. Remove the EVP Relay from the relay connector in the PDC.
3. Ignition on, engine not running.
4. Using a 12-volt test light connected to ground, probe the Fused RUN/START circuit (terminal 85) at the EVP Relay connector.

Does the test light illuminate brightly?

Yes

- Go To [4](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ELECTRIC VACUUM PUMP (EVP) RELAY OPERATION

1. Measure the resistance of the EVP Relay Coil.

NOTE: Measure across terminals 85 and 86 of the relay.

Is the resistance between 60 to 80 Ohms?

Yes

- Go To [5](#)

No

- Verify that there is good pin to terminal contact at the EVP Relay and PCM harness connectors. If OK, replace the EVP Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE EVP (T108) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the Electric Vacuum Pump harness connector.
2. Disconnect the PDC C3 harness connector.
3. Measure the resistance of the EVP (T108) Supply circuit between the Electric Vacuum Pump harness connector and the PDC C3 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the EVP (T108) Supply circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE EVP (T108) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the EVP (T108) Supply circuit at the PDC C3 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the EVP (T108) Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE EVP (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance between ground and the (Z908) Ground circuit at the Electric Vacuum Pump harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the (Z908) Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE POWER DISTRIBUTION CENTER OPERATION

1. Measure the resistance of the EVP (T108) Supply circuit between the EVP Relay and the PDC C3 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P258B-00-ELECTRIC VACUUM PUMP PERFORMANCE

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Electric Vacuum Pump (EVP) system is installed to provide supplemental vacuum to the brake booster, when the engine vacuum supply is low. The pump is connected to the engine and the brake booster through a series of hoses and one-way flow check valves. A pressure sensor, mounted in the brake booster, provides information to the ABS/ESP Module. This information is then sent to the Powertrain Control Module (PCM) over the CAN C BUS. The PCM modulates the EVP operation to maintain the brake booster vacuum within a given range. This system ensures that the customer experiences a consistent brake pedal feel under all driving conditions. Both Vacuum Pump Relays are controlled by the PCM through the use of an internal Low Side Driver (LSD) Control.

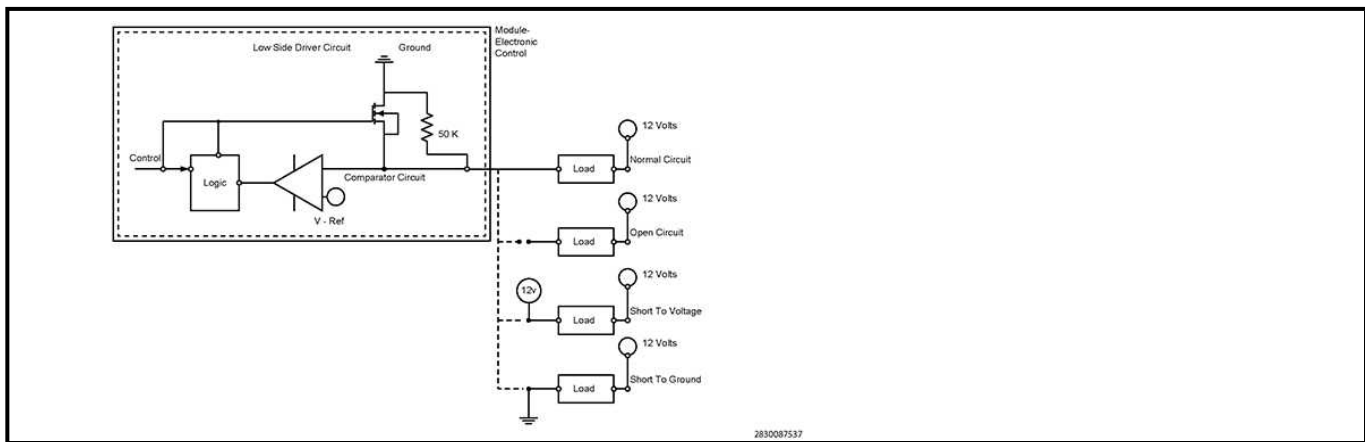
Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and

the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.

- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- Minimum Manifold Absolute Pressure (MAP) reading is 15 kpa (4.4 in Hg).
- Electric Vacuum Pump (EVP) minimum vacuum is -35 kpa (-10 in Hg) and the EVP cannot create 3 kpa (1.0 in Hg)
- System cannot increase the vacuum from -35 kpa (-10 in Hg) to -38 kpa (-11 in Hg).

DEFAULT ACTION

- This is a non-MIL fault.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
FUSED B+ CIRCUIT OPEN
VACUUM PUMP RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
VACUUM PUMP RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
ELECTRIC VACUUM PUMP (EVP) GROUND CIRCUIT OPEN
PINCHED, CUT OR OPEN VACUUM SUPPLY LINE

Possible Causes
VACUUM PRESSURE SENSOR
BRAKE VACUUM BOOSTER
BRAKE VACUUM BOOSTER CHECK VALVE
ELECTRIC VACUUM PUMP (EVP)
POWER DISTRIBUTION CENTER (PDC)
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are DTCS P258A-00, P258C-00 or P258D-00 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To 3

3. CHECK THE ELECTRIC VACUUM PUMP (EVP) OPERATION

NOTE: If the scan tool does not have the actuator function, it may be necessary to use a fused jumper wire at the relay to activate the Electronic Vacuum Pump (EVP).

1. Turn the ignition on.

2. With the scan tool actuate the Electronic Vacuum Pump (EVP).

Does the EVP run?

Yes

- Go To 10

No

- Go To 4

4. CHECK THE VACUUM PUMP RELAY (T110) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Using a 12-Volt test light connected to 12 Volts, back probe the Vacuum Pump Relay (T110) Control circuit at the PDC C3 harness connector.
3. Ignition on, engine not running.
4. With the scan tool actuate the Electronic Vacuum Pump (EVP).

Does the test light illuminate brightly?

Yes

- Go To 6

No

- Go To 5

5. CHECK THE VACUUM PUMP RELAY (T110) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PDC C3 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the Vacuum Pump Relay (T110) Control circuit between the PDC C3 harness connector and the PCM C1 harness connector.

Is the resistance less than 3.0 Ohms?

Yes

- Go To 6

No

- Repair the Vacuum Pump Relay (T110) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK THE VACUUM PUMP RELAY (T108) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Reconnect the PDC C3 harness connector (if it was previously disconnected).
3. Reconnect the PCM C1 harness connector (if it was previously disconnected).
4. Using a 12-Volt test light connected to ground, back probe the Vacuum Pump Relay (T108) Output circuit at the PDC C3 harness connector.
5. Ignition on, engine not running.

6. With the scan tool actuate the EVP.

Does the test light illuminate brightly?

Yes

- Go To 7

No

- Go To 9

7. CHECK THE VACUUM PUMP RELAY (T108) OUTPUT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PDC C3 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the Vacuum Pump Relay (T108) Output circuit between the PDC C3 harness connector and the PCM C1 harness connector.

Is the resistance less than 3.0 Ohms?

Yes

- Go To 8

No

- Repair the Vacuum Pump Relay (T108) Output circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

8. CHECK THE (Z908) EVP GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Using a 12-volt test light connected to 12 Volts, probe the (Z908) EVP Ground circuit at the EVP harness connector.

Does the test light illuminate brightly?

Yes

- Replace the Electric Vacuum Pump (EVP) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the (Z908) EVP Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

9. CHECK THE PDC FOR PROPER OPERATION

1. Check Fuse 74 (20A) on the PDC for an open.

Is the fuse open?

Yes

- Replace Fuse 74 (20A) and determine what caused the short circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK FOR PINCHED VACUUM SUPPLY LINE

1. Turn the ignition off.
2. Check the vacuum supply line to brake booster for a pinched, cut or open hose.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To 11

11. CHECK THE VACUUM PRESSURE SIGNAL ON THE SCAN TOOL

1. Start the engine.
2. With the scan tool, view and record the vacuum pressure signal with foot off the brake pedal.
3. With the scan tool, view the vacuum pressure signal while pressing the brake pedal several times.
4. Record the highest value.

Without the brake pedal applied, was the vacuum pressure signal -40 kpa (12 in. Hg)?

Yes

- Go To 12

No

- Replace the Power Brake Booster in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK FOR VACUUM PRESSURE SIGNAL CHANGE ON THE SCAN TOOL

1. Turn the ignition on.
2. Remove the Vacuum Pressure Sensor from the Booster.
3. Connect a vacuum pump to the Vacuum Pressure Sensor.
4. Apply vacuum to the Vacuum Pressure Sensor and watch for signal change.

Is the voltage signal changing on the scan tool as vacuum is being applied?

Yes

- Go To 13

No

- Replace the Vacuum Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

13. CHECK BRAKE BOOSTER CHECK VALVE

1. Remove the Brake Booster Check Valve.
2. Apply vacuum to the booster side of the check valve.

Is the Brake Booster Check Valve holding vacuum?

Yes

- Go To 14

No

- Replace the Power Brake Booster Check Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

14. CHECK THE POWER BRAKE BOOSTER OPERATION

1. Reinstall the Brake Booster Check Valve.
2. Apply vacuum to the Brake Booster.

Is the Power Brake Booster holding vacuum?

Yes

- Go To 15

No

- Replace the Power Brake Booster in accordance with the Service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

15. CHECK THE ANTI-LOCK BRAKE SYSTEM (ABS) MODULE OPERATION AND ANY RELATED CONNECTORS

1. Turn the ignition off to the lock position.
2. Perform any Technical Service Bulletins that may apply.
3. Inspect the related wiring harness. Look for any chafed, pierced, pinched or partially broken wires.
4. Inspect the related wire harness connectors. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information.
- Perform the ABS VERIFICATION TEST. Refer to [**ABS VERIFICATION TEST**](#) .

P258C-00-VACUUM PUMP CONTROL CIRCUIT LOW

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

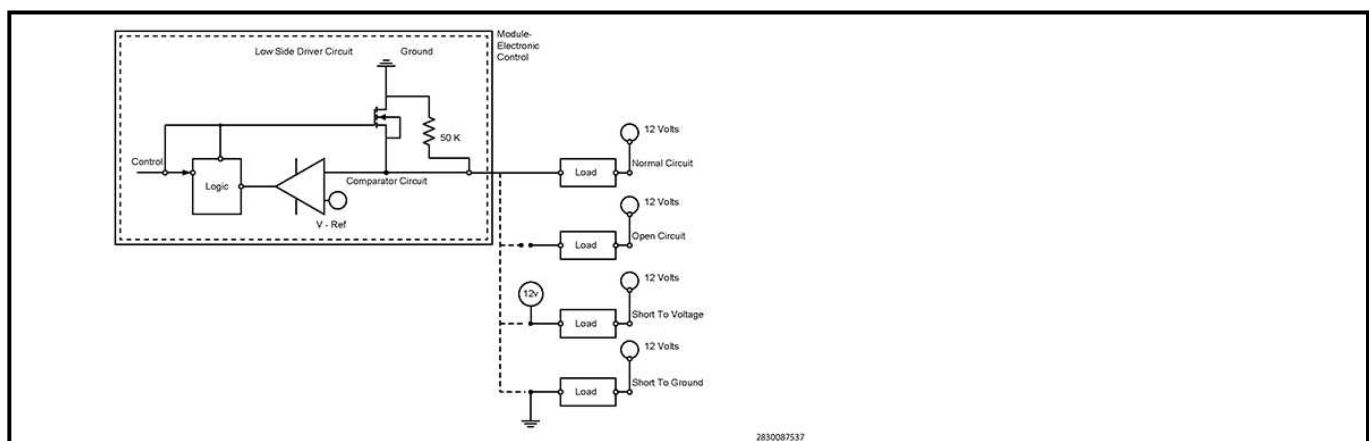
THEORY OF OPERATION

The Electric Vacuum Pump (EVP) system is installed to provide supplemental vacuum to the brake booster, when the engine vacuum supply is low. The pump is connected to the engine and the brake booster through a series of hoses and one-way flow check valves. A pressure sensor, mounted in the brake booster, provides information to the ABS/ESP Module. This information is then sent to the Powertrain Control Module (PCM) over the CAN C BUS. The PCM modulates the EVP operation to maintain the brake booster vacuum within a given range. This system ensures that the customer experiences a consistent brake pedal feel under all driving conditions. Both Vacuum Pump Relays are controlled by the PCM through the use of an internal Low Side Driver (LSD) Control.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With ignition on.
- Battery voltage above 10.0 Volts.

SET CONDITION

- The actual Electric Vacuum Pump (EVP) state is not equal to the desired EVP state.

DEFAULT ACTION

- This is a non-MIL fault.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
EVP RELAY CONTROL CIRCUIT OPEN
EVP RELAY CONTROL CIRCUIT SHORTED TO GROUND
ELECTRIC VACUUM PUMP (EVP) RELAY
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ELECTRONIC VACUUM PUMP (EVP) RELAY OPERATION

1. Turn the ignition off.
2. Measure the resistance of the EVP Relay Coil.

NOTE: **Measure across terminals 85 and 86 of the relay.**

Is the resistance between 60 to 80 Ohms?

Yes

- Go To [3](#)

No

- Verify that there is good pin to terminal contact in the EVP Relay and Powertrain Control Module connectors. If OK, replace the EVP Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

3. CHECK THE EVP RELAY (T110) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PDC C3 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the EVP Relay (T110) Control circuit between the PCM C1 harness connector and the PDC C3 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [**4**](#)

No

- Repair the EVP Relay (T110) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE EVP RELAY (T110) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the EVP Relay (T110) Control circuit at the PDC C3 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [**5**](#)

No

- Repair the EVP Relay (T110) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE PDC OPERATION

1. Measure the resistance of the EVP Relay (T110) Control circuit between the EVP Relay and the PDC C3 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [**6**](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P258D-00-VACUUM PUMP CONTROL CIRCUIT HIGH

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

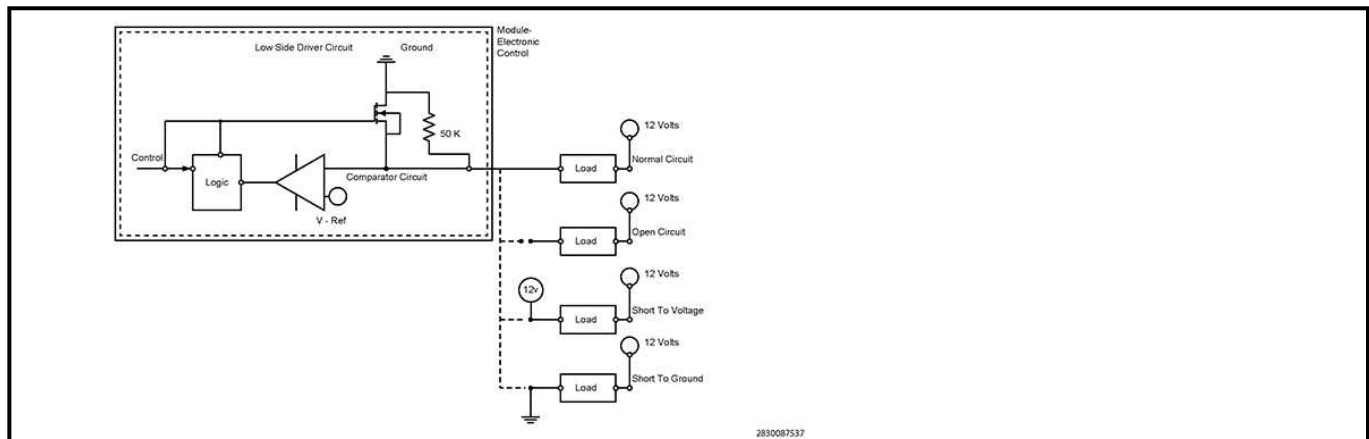
The Electric Vacuum Pump (EVP) system is installed to provide supplemental vacuum to the brake booster, when the engine vacuum supply is low. The pump is connected to the engine and the brake booster through a series of hoses and one-way flow check valves. A pressure sensor, mounted in the brake booster, provides information to the ABS/ESP Module. This information is then sent to the Powertrain Control Module (PCM)

over the CAN C BUS. The PCM modulates the EVP operation to maintain the brake booster vacuum within a given range. This system ensures that the customer experiences a consistent brake pedal feel under all driving conditions. Both Vacuum Pump Relays are controlled by the PCM through the use of an internal Low Side Driver (LSD) Control.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With ignition on.
- Battery voltage above 10.0 Volts.

SET CONDITION

- The actual Electronic Vacuum Pump (EVP) state is not equal to the desired EVP state. One Trip Fault.

DEFAULT ACTION

- This is a non-MIL fault.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
EVP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ELECTRIC VACUUM PUMP RELAY
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ELECTRONIC VACUUM PUMP (EVP) RELAY OPERATION

1. Turn the ignition off.
2. Measure the resistance of the EVP Relay Coil.

NOTE: Measure across terminals 85 and 86 of the relay.

Is the resistance between 60 to 80 Ohms?

Yes

- Go To [3](#)

No

- Verify that there is good pin to terminal contact in the EVP Relay and Powertrain Control Module connectors. If OK, replace the EVP Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE EVP RELAY (T110) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the PDC C3 harness connector.

2. Turn the ignition on.
3. Measure the EVP Relay (T110) Control circuit for voltage at the PDC C3 harness connector.

Is there voltage present?

Yes

- Repair the EVP Relay (T110) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE PDC OPERATION

1. Turn the ignition off.
2. Connect the PDC C3 harness connector.
3. Turn the ignition on.
4. Measure the EVP Relay (T110) Control circuit for voltage at the EVP Relay.

Is there voltage present?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To. Refer to [5](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P259C-00-EXCESSIVE TIME TO ENTER CLOSED LOOP TURBOCHARGER 1 BOOST CONTROL WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the Turbocharger Boost Control remains in open loop longer than a calibrated amount of time for a given engine speed and load. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER PCM DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are P016E, P016F, P0087, P0088, any EGR DTCs, any FRP DTCs, any Injector DTCs or any O2 Sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2610-00-PCM INTERNAL ENGINE OFF TIMER PERFORMANCE

WHEN MONITORED

This diagnostic runs once per ignition cycle when the following conditions are met:

- Shortly after an initial engine start.
- The difference between the coolant temperature and ambient air temperature is greater than 15B°C (59B°F) at initial engine start.
- The engine coolant temperature recorded at the last engine shut down was above 83B°C (181.4B°F).
 - If the previous engine shut down temperature was not above this value, the shut down diagnostic will not be performed during this ignition cycle.
- There was a minimum of 10B°C (50B°F) temperature drop during the last ignition off.
- If the above monitoring conditions are met, the PCM uses the engine coolant temperature drop to calculate a maximum engine off time threshold. It then compares the previous key off time to the calibrated maximum threshold.

SET CONDITION

- The PCM determines that the actual previous key off time is above the calculated threshold this fault is set.

DEFAULT ACTION

- MIL is illuminated

POSSIBLE CAUSES

Possible Causes
COOLING SYSTEM ISSUES
AMBIENT AIR TEMPERATURE (AAT) SENSOR
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
POWERTRAIN CONTROL MODULE (PCM) SOFTWARE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK THE POWERTRAIN CONTROL MODULE (PCM) SOFTWARE LEVEL

NOTE: An aftermarket block heater installed may cause this DTC to set.

1. Turn the ignition on.
2. With the scan tool, verify that the PCM is operating at the latest software version available.
3. Perform any Service Bulletins or PCM flash updates that may apply.

Were any Service Bulletins or PCM flash updates available for this condition?

Yes

- Update the PCM software in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. CHECK THE AAT SENSOR OPERATION

1. Turn the ignition off.
2. Allow the vehicle to sit with the ignition off in an environment where the temperature is consistent and above -7B°C (19.4B°F) until the engine coolant temperature is equal, or close to the environmental ambient temperature.
3. Turn the ignition on.
4. With a scan tool, compare the AAT Sensor value to the current ambient temperature.

Is the AAT Sensor value within 5B°C (9B°F) of the current ambient temperature?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK THE COOLANT LEVEL AND CONDITION

WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or fatal injury. Allow the engine to cool before opening the cooling system.

1. Check the cooling system to make sure that the coolant is in good condition and at the proper level. Refer to **COOLING SYSTEM**.

Is the coolant level and condition OK?

Yes

- Go To [4](#)

No

- Inspect the vehicle for a coolant leak and add the necessary amount of coolant. Refer to **COOLING SYSTEM**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE COOLING SYSTEM OPERATION

NOTE: If engine coolant temperature is above 65B°C (149B°F), allow the engine to cool until it is below 65B°C (149B°F).

1. Start the engine.
2. During engine warm-up monitor the Engine Coolant Temperature degree value. The temperature value change should be a smooth transition from start up to normal operating temp 82B°C (180B°F). Also monitor the actual coolant temperature with a digital thermometer at or near the ECT Sensor and Thermostat positions.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool Engine Coolant Temperature degree values should stay relatively close to each other.

Was the digital thermometer readings relatively close to the scan tool reading for the ECT Sensor?

Yes

- Go To [5](#)

No

- Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2635-00-FUEL PUMP 1 LOW FLOW-PERFORMANCE

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Battery voltage greater than 11.0 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects a difference between the Variable Speed Fuel Pump Actual pressure and Desired pressure reading.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL LEAK
RESTRICTED FUEL SUPPLY

Possible Causes
HIGH RESISTANCE IN THE 5-VOLT SUPPLY CIRCUIT
HIGH RESISTANCE IN THE FUEL PRESSURE SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE IN THE SENSOR GROUND CIRCUIT
FUEL PRESSURE SENSOR
FUEL PUMP ASSEMBLY
FUEL PUMP CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [3](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. CHECK FOR ANY FUEL LEAKS

1. Check for any fuel leaks in the fuel delivery system.

Are there any fuel leaks?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK FOR ANY FUEL LINE RESTRICTIONS

1. Check for any fuel line restrictions in the fuel delivery system.

Are there fuel line restrictions?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **5**

5. ISOLATE AND CHECK THE FUEL PRESSURE SENSOR (F856) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To **6**

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. ISOLATE AND CHECK THE FUEL PRESSURE SENSOR (K179) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE FUEL PRESSURE SENSOR (K916) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. REPLACE THE FUEL PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. REPLACE THE FUEL PUMP ASSEMBLY AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Fuel Pump in accordance with the Service Information.

3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty Fuel Pump repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2681-00-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT OPEN

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open circuit on the Coolant Three Way Valve Control circuit.

DEFAULT ACTION

- MIL light will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLANT THREE WAY VALVE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
COOLANT THREE WAY VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. PERFORM THE SCAN TOOL COOLANT THREE WAY VALVE TEST

1. Turn the ignition on.
2. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass or fail?

Fail

- Go To [3](#)

Pass

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

3. CHECK THE ELECTRIC COOLANT PUMP (K501) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the Electric Coolant Pump (K501) Control circuit between the Coolant Three Way Valve harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Electric Coolant Pump (K501) Control circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE ABILITY OF THE PCM TO READ THE COOLANT THREE WAY VALVE CONTROL

1. Connect the Powertrain Control Module (PCM) C1 harness connector.
2. Connect a jumper between ground and the Electric Coolant Pump (K501) Control circuit at the Coolant Three Way Valve harness connector.
3. Turn the ignition on.

Is the P2862-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT LOW DTC active or pending with the jumper in place?

Yes

- Replace the Coolant Three Way Valve in accordance with the Service Information. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2682-00-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT LOW

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Coolant Three Way Valve Control circuit.

DEFAULT ACTION

- MIL light will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLANT THREE WAY VALVE CONTROL CIRCUIT SHORTED TO GROUND
COOLANT THREE WAY VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. PERFORM THE SCAN TOOL COOLANT THREE WAY VALVE TEST

1. Turn the ignition on.
2. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass or fail?

Fail

- Go To [3](#)

Pass

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

3. CHECK THE ABILITY OF THE PCM TO READ THE COOLANT THREE WAY VALVE CONTROL

1. Disconnect the Coolant Three Way Valve harness connector.
2. Connect a jumper between ground and the Electric Coolant Pump (K501) Control circuit at the Coolant Three Way Valve harness connector.
3. Turn the ignition on.

Is the P2862-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT LOW DTC active or pending with the jumper in place?

Yes

- Replace the Coolant Three Way Valve in accordance with the Service Information. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2683-00-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT HIGH

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to voltage on the Coolant Three Way Valve Control circuit.

DEFAULT ACTION

- MIL light will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLANT THREE WAY VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE
COOLANT THREE WAY VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. PERFORM THE SCAN TOOL COOLANT THREE WAY VALVE TEST

1. Turn the ignition on.
2. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass or fail?

Fail

- Go To [3](#)

Pass

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK THE ELECTRIC COOLANT PUMP (K501) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between the Electric Coolant Pump (K501) Control circuit and all other circuits at the Powertrain Control Module (PCM) C1 harness connector.

Is there continuity between the Electric Coolant Pump (K501) Control circuit and any other circuit?

Yes

- Repair the Electric Coolant Pump (K501) Control circuit for a short to the circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO READ THE COOLANT THREE WAY VALVE CONTROL

1. Reconnect the PCM C1 harness connector.
2. Connect a jumper between ground and the Coolant Three Way Valve (K501) Control circuit at the Coolant Three Way Valve harness connector.
3. Turn the ignition on.

Is the P2862-ENGINE COOLANT BYPASS VALVE CONTROL CIRCUIT LOW DTC active or pending with the jumper in place?

Yes

- Replace the Coolant Three Way Valve in accordance with the Service Information. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant

Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P268C-00-CYLINDER 1 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector 1 value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P268D-00-CYLINDER 2 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P268E-00-CYLINDER 3 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P268F-00-CYLINDER 4 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P2690-00-CYLINDER 5 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P2691-00-CYLINDER 6 INJECTOR DATA INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector value has not been programmed does not match.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INJECTOR QUANTITY ADJUSTMENT NOT PROGRAMMED INTO THE POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Program the Injector Quantity Adjustment into the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

P26A3-00-ENGINE COOLANT BYPASS VALVE 1 PERFORMANCE

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) does not detect any movement in the Coolant Three Way Valve when it is commanded to move.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION RUN/START CIRCUIT OPEN OR SHORTED TO GROUND
COOLANT THREE WAY VALVE GROUND CIRCUIT OPEN
COOLANT THREE WAY VALVE STUCK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE (F856) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the (F856) 5-Volt Supply circuit at the Coolant Three Way Valve harness connector.

Is the voltage between 4.9 and 5.1 volts?

Yes

- Go To [4](#)

No

- Repair the (F856) 5-Volt Supply circuit for a an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE FUSED IGNITION (F947) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE OR SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the Fused Ignition (F947) Output circuit at the Coolant Three Way Valve harness connector.

Is the voltage approximately equal to Battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F947) Output circuit for a an open circuit or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z908) Ground circuit at the Coolant Three Way Valve harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK THE COOLANT THREE WAY VALVE OPERATION

1. Install the Coolant Three Way Valve.
2. Turn the ignition on.
3. With the scan tool, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
4. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass or fail?

Pass

- Go To [7](#)

Fail

- Replace the Coolant Three Way Valve in accordance with the Service Information. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P26A6-00-ENGINE COOLANT BYPASS VALVE 1 POSITION SENSOR CIRCUIT LOW

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition key on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The Coolant Three Way Valve Position Sensor voltage at Powertrain Control Module (PCM) is below the minimum acceptable threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLANT THREE WAY VALVE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
COOLANT THREE WAY VALVE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
COOLANT THREE WAY VALVE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE ABILITY OF THE PCM TO READ THE COOLANT THREE WAY VALVE POSITION SIGNAL

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Turn the ignition on, engine not running.
4. With the scan tool, read DTCs.

NOTE: The scan tool should display a **P26A7-ENGINE COOLANT BYPASS VALVE POSITION SENSOR CIRCUIT HIGH DTC** as active or pending with the harness connector disconnected.

Does the P26A7-ENGINE COOLANT BYPASS VALVE POSITION SENSOR CIRCUIT HIGH DTC set as active or pending with the harness connector unplugged?

Yes

- Verify that there is good pin to terminal contact in the Switch and Powertrain Control Module connectors. Replace the Coolant Three Way Valve if no problems were found in the connector. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE COOLANT THREE WAY VALVE (K473) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Check for continuity between ground and the Coolant Three Way Valve (K473) Signal circuit at the Coolant Three Way Valve harness connector.

Is there continuity between ground and the Coolant Three Way Valve (K473) Signal circuit?

Yes

- Repair the Coolant Three Way Valve (K473) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR THE COOLANT THREE WAY VALVE (K473) SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

1. Check for continuity between the Coolant Three Way Valve (K473) Signal circuit and the (K900) Sensor Ground circuit at the Coolant Three Way Valve harness connector.

Is there continuity between the Coolant Three Way Valve (K473) Signal circuit and the (K900) Sensor Ground circuit?

Yes

- Repair the short between the Coolant Three Way Valve Position (K473) Signal circuit and the (K900) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P26A7-00-ENGINE COOLANT BYPASS VALVE 1 POSITION SENSOR CIRCUIT HIGH

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition key on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The Coolant Three Way Valve Position Sensor voltage at Powertrain Control Module (PCM) is above the minimum acceptable threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLANT THREE WAY VALVE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
COOLANT THREE WAY VALVE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
COOLANT THREE WAY VALVE POSITION SIGNAL CIRCUIT SHORTED TO THE 5-VOLT SUPPLY CIRCUIT
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
COOLANT THREE WAY VALVE POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE COOLANT THREE WAY VALVE (K473) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Engine Coolant Three Way Valve harness connector.
3. Ignition on, engine not running.
4. Measure the voltage on the Engine Coolant Three Way Valve (K473) Signal circuit at the Engine Coolant 3-Way Valve harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Engine Coolant Three Way Valve (K473) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM harness connector.
3. Measure the resistance of the (K900) Sensor Ground circuit between the Coolant Three Way Valve harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (K900) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ENGINE COOLANT THREE WAY VALVE FOR PROPER OPERATION

NOTE: Leave the Engine Coolant Three Way Valve disconnected.

1. Reconnect the PCM harness connector.
2. Ignition on, engine not running.
3. With the scan tool, monitor DTCs.
4. With the scan tool, read DTCs.

NOTE: The scan tool should display a P26A6-ENGINE COOLANT BYPASS VALVE POSITION SENSOR CIRCUIT LOW DTC as Active or Pending with the Engine Coolant Three Way Valve harness connector disconnected.

Does the P26A6-ENGINE COOLANT BYPASS VALVE POSITION SENSOR CIRCUIT LOW DTC set as Active or Pending with the Engine Coolant Three Way Valve harness connector disconnected?

Yes

- Verify that there is good pin to terminal contact at the Valve and Powertrain Control Module connectors. Replace the Coolant Three Way Valve if no problems were found in the connector.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P26AB-00-ENGINE COOLANT BYPASS VALVE 1 STUCK

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The primary purpose of transmission thermal management system is to keep the Transmission fluid at its optimal operating temperature range. This is accomplished by directing coolant flow not required for cabin heat to the Thermal Management Unit (TMU) located on the left hand side of the Transmission which transfers heat from the engine coolant to the transmission oil fluid. Coolant flow is directed by means of the Coolant Three Way Valve located upstream of the cabin heater coolant supply. The coolant that is sent from the Coolant Three Way Valve warms the transmission fluid in order to get it up to the ideal operating temperature range quicker.

The Coolant Three Way Valve is supplied Battery voltage and a ground circuit. The Coolant Three Way Valve position is electrically controlled using a 12 volt PWM high side signal from the Powertrain Control Module (PCM). The PCM will send a PWM signal of 25% or 75% to the Coolant Three Way Valve, depending on whether the coolant is desired to be directed to the Heater Core or the TMU. The Coolant Three Way Valve has an internal position sensor that sends a signal back to the PCM. The sensor operates as a typical three wire sensor which has a 5-Volt Supply circuit, Signal circuit, and Return circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) does not detect any movement in the Coolant Three Way Valve when it is commanded to move.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION RUN/START CIRCUIT OPEN OR SHORTED TO GROUND
COOLANT THREE WAY VALVE GROUND CIRCUIT OPEN
COOLANT THREE WAY VALVE STUCK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

No

- Go To [2](#)

2. CHECK FOR OTHER DTCS

1. With the scan tool, read DTCS.
2. Refer to the recorded DTCS.

Are there any 5-Volt Reference DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. CHECK THE (F856) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the (F856) 5-Volt Supply circuit at the Coolant Three Way Valve harness connector.

Is the voltage between 4.9 and 5.1 volts?

Yes

- Go To [4](#)

No

- Repair the (F856) 5-Volt Supply circuit for a an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE FUSED IGNITION (F947) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE OR SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Coolant Three Way Valve harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the Fused Ignition (F947) Output circuit at the Coolant Three Way Valve harness connector.

Is the voltage approximately equal to Battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F947) Output circuit for a an open circuit or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z908) Ground circuit at the Coolant Three Way Valve harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE COOLANT THREE WAY VALVE OPERATION

1. Install the Coolant Three Way Valve.
2. Turn the ignition on.
3. With the scan tool, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
4. With the scan tool, navigate to System Test and select the Coolant Three Way Valve Test.

Did the Coolant Valve Three Way Valve Test pass or fail?

Pass

- Go To [7](#)

Fail

- Replace the Coolant Three Way Valve in accordance with the Service Information. After the Coolant Three Way Valve is replaced, navigate to Misc Functions, and select the Coolant Three Way Valve Replaced selection to clear the Coolant Three Way Valve actuation counter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P26E4-00-STARTER CONTROL 2 CIRCUIT

THEORY OF OPERATION

General Operation: The Engine Stop/Start (ESS) system uses a **Power Control Relay (PCR)** and two Batteries to eliminate the voltage drop in the system voltage during an AutoStart event. The purpose of this is for the consumer electronics and vehicle modules subsystems to continue to function in a normal manner. The Power Control Relay is connected in-line between the Main (Cranking) Battery and the Auxiliary (Vehicle) Battery. The Power Control Relay is normally closed when de-energized, connecting the two Batteries. When the Power Control Relay is energized, the relay opens and breaks the connection between the Batteries. The **Power Control Relay** is energized when 12.0 volts is supplied from the output of the **PCR Control Relay in the PDC** . The PCR Control Relay is controlled by the Powertrain Control Module (PCM) using a Low Side Driver (LSD).

Key Start and normal driving: The engine starting and charging systems are connected in parallel to the Main Battery and Auxiliary Battery and charges both Batteries simultaneously. The starting and charging systems are connected directly to the Main Battery. The starting and charging systems are connected to the Auxiliary Battery when the Power Control Relay is de-energized (closed). Therefore, if the Power Control Relay is stuck on (open), the Auxiliary Battery will not charge. The Power Control Relay remains closed **during all non-AutoStart crank events and while driving**. With the Power Control Relay closed during a **non-AutoStart** crank event, the Auxiliary Battery is connected to the starting system and will have a voltage drop during cranking.

AutoStart Event: When in ESS mode, and an **AutoStart crank event is initiated** , the Power Control Relay is temporarily energized which opens the relay, breaking the connection and allowing the Batteries to work independently. When this occurs, the Main Battery is used to crank and start the engine. The Auxiliary Battery, which is now solely connected to the PDC and is not affected by cranking, can maintain full Battery voltage to the rest of the vehicle modules and subsystems.

Diagnostics: It is important for the Power Control Relay to operate properly for the Auxiliary Battery to charge correctly with the engine running and be disconnected during an AutoStart event, the PCM will run diagnostics to determine if the Power Control Relay is stuck in the On (open) or off (closed) positions.

- During a key crank event, the voltage supply from the Auxiliary Battery to the PCM is monitored. If the voltage drops low enough to cause a PCM reset, the Auxiliary Battery state of charge is determined to be too low.
- After the engine is started and running the Auxiliary Battery system voltage is monitored and compared to the charging system feedback voltage. If the Auxiliary Battery voltage is below the charging system voltage by more than a calibrated threshold **the circuitry that connects the Main Battery to the Auxiliary Battery is determined to be open. The Power Control Relay is only one part of this circuit.**
- The Power Control Relay is monitored for a stuck closed condition during an Auto Start Event. If the difference between the Auxiliary Battery voltage and the Main Battery voltage is not more than a

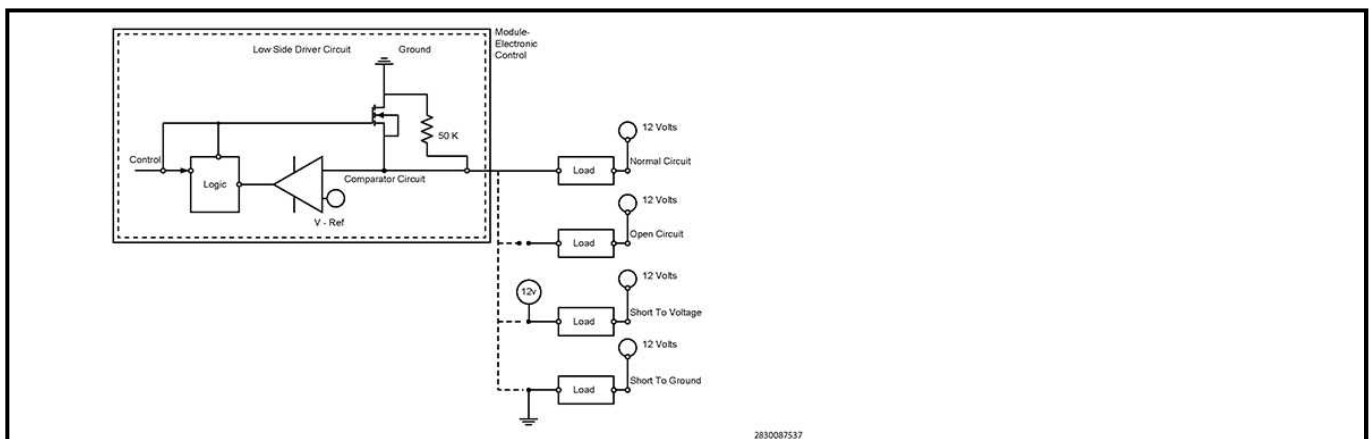
calibrated threshold during an Auto Start cranking event, the Power Control Relay is determined to be stuck closed.

NOTE: The terminology on the relays in this procedure can be confusing. For clarity, the Power Control Relay is the relay that makes and breaks the connection between the two Batteries. The PCR Control Relay is controlled by the PCM using a typical Low Side Driver (LSD) and is the relay that provides the power supply to operate the Power Control Relay.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- PCR Control Relay commanded off.

SET CONDITION

- The PCM detects an open in the PCR Control Relay Control circuitry or over temperature condition for the internal driver.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PCR CONTROL RELAY CIRCUIT OPEN/HIGH RESISTANCE
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE PCR CONTROL RELAY AND PDC FOR PROPER OPERATION

1. Turn the ignition on.
2. Using a 12-volt test light connected to ground, back probe the PCR Control Relay (T762) Control circuit at the PDC connector.
3. Using a 12-volt test light connected to ground, probe the PCR Control Relay (T760) Output circuit at the PDC connector to verify the relay is closing when energized. The test light should illuminate when the relay is closed.

NOTE: The relay may also make an audible click when closing.

Does the PCR Control Relay close when the control circuit is grounded?

Yes

- Go To [3](#)

No

- Go To [5](#)

3. CHECK THE PCR CONTROL RELAY (T762) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the PCR Control Relay (T762) Control circuit between the PDC harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the PCR Control Relay (T762) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PDC

1. Using the wiring information as a guide, measure the main Battery supply voltage at the PDC terminal.

Is Battery voltage present?

Yes

- Go To [6](#)

No

- Repair the Battery voltage supply to the PDC for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PCR CONTROL RELAY COIL

1. Remove the Stop/Start Relay from the PDC.
2. Connect a fused jumper between terminal 30 and terminal 87 of the Stop/Start Relay.
3. Using the wiring information as a guide, back probe and measure the voltage on the PCR Control Relay (T762) Control circuit at the PDC terminal.

Is Battery voltage present?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Check all fuses in the PDC. If a fuse is found to be open, replace the fuse and retest. If no problems are found with the fuses, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P26E5-00-STARTER CONTROL 2 CIRCUIT LOW

THEORY OF OPERATION

General Operation: The Engine Stop/Start (ESS) system uses a **Power Control Relay (PCR)** and two Batteries to eliminate the voltage drop in the system voltage during an AutoStart event. The purpose of this is for the consumer electronics and vehicle modules subsystems to continue to function in a normal manner. The Power Control Relay is connected in-line between the Main (Cranking) Battery and the Auxiliary (Vehicle)

Battery. The Power Control Relay is normally closed when de-energized, connecting the two Batteries. When the Power Control Relay is energized, the relay opens and breaks the connection between the Batteries. The **Power Control Relay** is energized when 12.0 volts is supplied from the output of the **PCR Control Relay in the PDC**. The PCR Control Relay is controlled by the Powertrain Control Module (PCM) using a Low Side Driver (LSD).

Key Start and normal driving: The engine starting and charging systems are connected in parallel to the Main Battery and Auxiliary Battery and charges both Batteries simultaneously. The starting and charging systems are connected directly to the Main Battery. The starting and charging systems are connected to the Auxiliary Battery when the Power Control Relay is de-energized (closed). Therefore, if the Power Control Relay is stuck on (open), the Auxiliary Battery will not charge. The Power Control Relay remains closed **during all non-AutoStart crank events and while driving**. With the Power Control Relay closed during a **non-AutoStart** crank event, the Auxiliary Battery is connected to the starting system and will have a voltage drop during cranking.

AutoStart Event: When in ESS mode, and an **AutoStart crank event is initiated**, the Power Control Relay is temporarily energized which opens the relay, breaking the connection and allowing the Batteries to work independently. When this occurs, the Main Battery is used to crank and start the engine. The Auxiliary Battery, which is now solely connected to the PDC and is not affected by cranking, can maintain full Battery voltage to the rest of the vehicle modules and subsystems.

Diagnostics: It is important for the Power Control Relay to operate properly for the Auxiliary Battery to charge correctly with the engine running and be disconnected during an AutoStart event, the PCM will run diagnostics to determine if the Power Control Relay is stuck in the On (open) or off (closed) positions.

- During a key crank event, the voltage supply from the Auxiliary Battery to the PCM is monitored. If the voltage drops low enough to cause a PCM reset, the Auxiliary Battery state of charge is determined to be too low.
- After the engine is started and running the Auxiliary Battery system voltage is monitored and compared to the charging system feedback voltage. If the Auxiliary Battery voltage is below the charging system voltage by more than a calibrated threshold **the circuitry that connects the Main Battery to the Auxiliary Battery is determined to be open. The Power Control Relay is only one part of this circuit.**
- The Power Control Relay is monitored for a stuck closed condition during an Auto Start Event. If the difference between the Auxiliary Battery voltage and the Main Battery voltage is not more than a calibrated threshold during an Auto Start cranking event, the Power Control Relay is determined to be stuck closed.

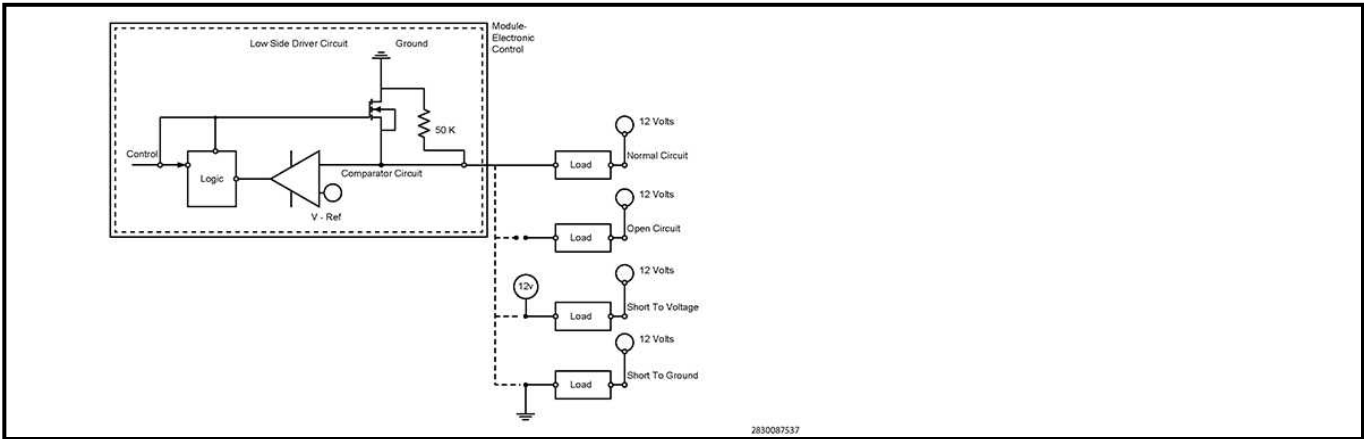
NOTE: The terminology on the relays in this procedure can be confusing. For clarity, the **Power Control Relay** is the relay that makes and breaks the connection between the two Batteries. The **PCR Control Relay** is controlled by the PCM using a typical Low Side Driver (LSD) and is the relay that provides the power supply to operate the Power Control Relay.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.

- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- PCR Control Relay commanded off.

SET CONDITION

- The PCM detects an a short to ground in the PCR Control Relay Control circuitry.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PCR CONTROL RELAY CIRCUIT SHORTED TO GROUND
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND CHECK THE PCR CONTROL RELAY (T762) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE PCR CONTROL RELAY AND PDC FOR PROPER OPERATION

1. Reconnect the component and ECU harness connectors.
2. Turn the ignition on.
3. Using a 12-volt test light connected to ground, back probe the PCR Control Relay (T762) Control circuit at the PDC connector.
4. Using a 12-volt test light connected to ground, probe the PCR Control Relay (T760) Output circuit at the PDC connector to verify the relay is closing when energized. The test light should illuminate when the relay is closed.

NOTE: **The relay may also make an audible click when closing.**

Does the PCR Control Relay close when the control circuit is grounded?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PDC

1. Using the wiring information as a guide, measure the main Battery supply voltage at the PDC terminal.

Is Battery voltage present?

Yes

- Go To [6](#)

No

- Repair the Battery voltage supply to the PDC for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PCR CONTROL RELAY COIL

1. Remove the Stop/Start Relay from the PDC.
2. Connect a fused jumper between terminal 30 and terminal 87 of the Stop/Start Relay.
3. Using the wiring information as a guide, back probe and measure the voltage on the PCR Control Relay (T762) Control circuit at the PDC terminal.

Is Battery voltage present?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Check all fuses in the PDC. If a fuse is found to be open, replace the fuse and retest. If no problems are found with the fuses, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P26E6-00-STARTER CONTROL 2 CIRCUIT HIGH

THEORY OF OPERATION

General Operation: The Engine Stop/Start (ESS) system uses a **Power Control Relay (PCR)** and two Batteries to eliminate the voltage drop in the system voltage during an AutoStart event. The purpose of this is for the consumer electronics and vehicle modules subsystems to continue to function in a normal manner. The Power Control Relay is connected in-line between the Main (Cranking) Battery and the Auxiliary (Vehicle) Battery. The Power Control Relay is normally closed when de-energized, connecting the two Batteries. When the Power Control Relay is energized, the relay opens and breaks the connection between the Batteries. The **Power Control Relay** is energized when 12.0 volts is supplied from the output of the **PCR Control Relay in the PDC** . The PCR Control Relay is controlled by the Powertrain Control Module (PCM) using a Low Side Driver (LSD).

Key Start and normal driving: The engine starting and charging systems are connected in parallel to the Main Battery and Auxiliary Battery and charges both Batteries simultaneously. The starting and charging systems are connected directly to the Main Battery. The starting and charging systems are connected to the Auxiliary Battery when the Power Control Relay is de-energized (closed). Therefore, if the Power Control Relay is stuck

on (open), the Auxiliary Battery will not charge. The Power Control Relay remains closed **during all non-AutoStart crank events and while driving**. With the Power Control Relay closed during a **non-AutoStart** crank event, the Auxiliary Battery is connected to the starting system and will have a voltage drop during cranking.

AutoStart Event: When in ESS mode, and an **AutoStart crank event is initiated**, the Power Control Relay is temporarily energized which opens the relay, breaking the connection and allowing the Batteries to work independently. When this occurs, the Main Battery is used to crank and start the engine. The Auxiliary Battery, which is now solely connected to the PDC and is not affected by cranking, can maintain full Battery voltage to the rest of the vehicle modules and subsystems.

Diagnostics: It is important for the Power Control Relay to operate properly for the Auxiliary Battery to charge correctly with the engine running and be disconnected during an AutoStart event, the PCM will run diagnostics to determine if the Power Control Relay is stuck in the On (open) or off (closed) positions.

- During a key crank event, the voltage supply from the Auxiliary Battery to the PCM is monitored. If the voltage drops low enough to cause a PCM reset, the Auxiliary Battery state of charge is determined to be too low.
- After the engine is started and running the Auxiliary Battery system voltage is monitored and compared to the charging system feedback voltage. If the Auxiliary Battery voltage is below the charging system voltage by more than a calibrated threshold **the circuitry that connects the Main Battery to the Auxiliary Battery is determined to be open. The Power Control Relay is only one part of this circuit.**
- The Power Control Relay is monitored for a stuck closed condition during an Auto Start Event. If the difference between the Auxiliary Battery voltage and the Main Battery voltage is not more than a calibrated threshold during an Auto Start cranking event, the Power Control Relay is determined to be stuck closed.

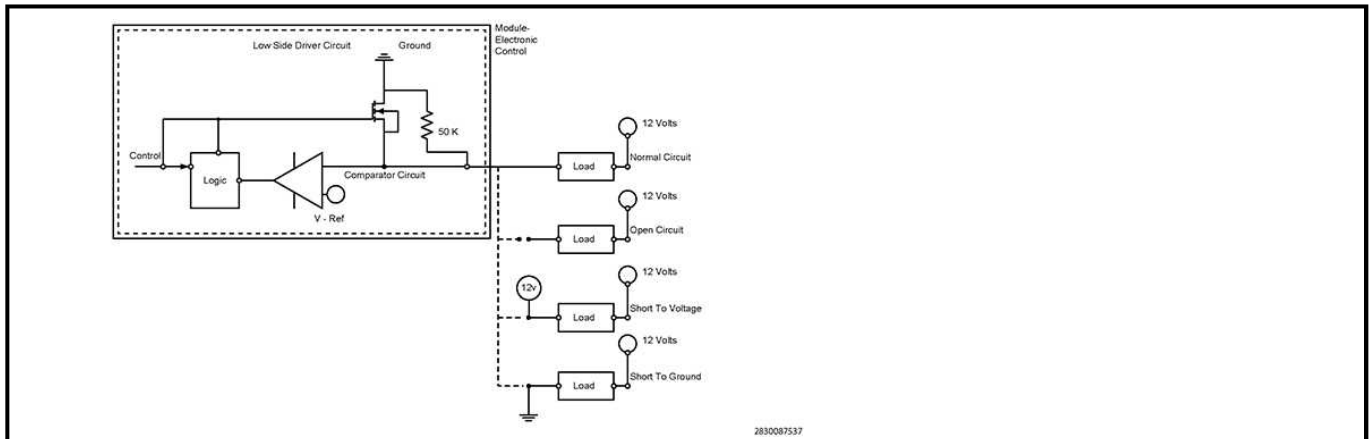
NOTE: The terminology on the relays in this procedure can be confusing. For clarity, the Power Control Relay is the relay that makes and breaks the connection between the two Batteries. The PCR Control Relay is controlled by the PCM using a typical Low Side Driver (LSD) and is the relay that provides the power supply to operate the Power Control Relay.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, controlling a solenoid or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The PCM also provides fault detection for the device, wiring and internal driver. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High

fault may be detected because the available voltage on the comparator circuit is above V-Ref.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- PCR Control Relay commanded on.

SET CONDITION

- The PCM detects a high voltage condition in the PCR Control Relay Control circuitry when the relay is commanded on.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PCR CONTROL RELAY CIRCUIT SHORTED TO VOLTAGE
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE PCR CONTROL RELAY (T762) CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK THE PCR CONTROL RELAY AND PDC FOR PROPER OPERATION

1. Reconnect the component and ECU harness connectors.
2. Turn the ignition on.
3. Using a 12-volt test light connected to ground, back probe the PCR Control Relay (T762) Control circuit at the PDC connector.
4. Using a 12-volt test light connected to ground, probe the PCR Control Relay (T760) Output circuit at the PDC connector to verify the relay is closing when energized. The test light should illuminate when the relay is closed.

NOTE: **The relay may also make an audible click when closing.**

Does the PCR Control Relay close when the control circuit is grounded?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PDC

1. Using the wiring information as a guide, measure the main Battery supply voltage at the PDC terminal.

Is Battery voltage present?

Yes

- Go To [6](#)

No

- Repair the Battery voltage supply to the PDC for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE BATTERY SUPPLY VOLTAGE TO THE PCR CONTROL RELAY COIL

1. Remove the Stop/Start Relay form the PDC.
2. Connect a fused jumper between terminal 30 and terminal 87 of the Stop/Start Relay.
3. Using the wiring information as a guide, back probe and measure the voltage on the PCR Control Relay (T762) Control circuit at the PDC terminal.

Is Battery voltage present?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Check all fuses in the PDC. If a fuse is found to be open, replace the fuse and retest. If no problems are found with the fuses, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P26FB-00-EGR COOLER BYPASS CONTROL STUCK CLOSED BANK 1

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The High Pressure Exhaust Gas Recirculation (HP EGR) Cooling Bypass system is used to redirect the HP EGR gases around the HP EGR Cooler when the engine is under certain operating conditions. The system consists of two devices.

The HP EGR Cooling Bypass Solenoid is a 2-wire electrical device. The solenoid is located on the Intake Manifold. This solenoid controls the crankcase vacuum supply to the HP EGR Cooling Bypass Actuator.

The EGR Cooling Bypass Actuator is a typical 'vacuum-diaphragm' device. The actuator is located on the EGR Cooler and is activated when the engine is cold or at idle.

The Powertrain Control Module (PCM) will light a MIL lamp after this monitor runs and fails in two consecutive drive cycles. The PCM will turn off the MIL lamp after the diagnostic passes in four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.
- Engine coolant temperature is above 45B°C (113B°F).

SET CONDITION

- The PCM detects that the HP EGR Cooler outlet temperature does not see a significant rise after cold starting the engine below 45B°C (113B°F) and the HP EGR Cooler outlet temperature is close to engine coolant temperature.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HP EGR SYSTEM FAULT
HP EGR VACUUM SUPPLY HOSES DAMAGED OR CLOGGED
HP EGR COOLING BYPASS SOLENOID
HP EGR COOLER VALVE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
HP EGR COOLER CLOGGED
HP EGR COOLING BYPASS ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any other circuit related HP EGR DTCS (P245A-00, P245C-00, P245D-00, or P04DA-00) active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [2](#)

2. CHECK THE HP EGR VACUUM SUPPLY HOSES FOR CLOGGING, LEAKS, OR OTHER DAMAGE

NOTE: This DTC is very often set due to damage to one of the Vacuum Supply Hoses.

1. Turn the ignition off.
2. Inspect the HP EGR Vacuum Supply Hose from the HP EGR to the HP EGR Cooling Bypass Solenoid.
3. Inspect the Vacuum Supply Hose from the HP EGR Cooling Bypass Solenoid to the HP EGR Cooling Bypass Actuator.

Are either HP EGR Vacuum Supply Hose kinked, pinched, leaking, or otherwise damaged?

Yes

- Replace the damaged HP EGR Vacuum Supply Hose in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. CHECK THE HP EGR VACUUM SUPPLY

1. Start the engine.
2. Run the engine until it reaches normal operating temperature.
3. Disconnect the HP EGR Vacuum Supply Hose (from the engine) at the HP EGR Cooling Bypass Solenoid.
4. Connect a vacuum gauge to the disconnected hose.

Does the vacuum gauge detect any vacuum coming from the engine?

Yes

- Go To [**4**](#)

No

- Determine the loss of HP EGR vacuum to the HP EGR Cooling Bypass Solenoid and repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE HP EGR COOLING BYPASS SOLENOID FOR PROPER OPERATION

1. Turn the ignition off.
2. Reconnect the HP EGR Vacuum Supply Hose (from the engine) back to the HP EGR Cooling Bypass Solenoid.
3. Disconnect the Vacuum Supply Hose at the HP EGR Cooling Bypass Solenoid. This is the hose routed from the HP EGR Cooling Bypass Solenoid to the HP EGR Cooling Bypass Actuator.
4. Start the engine.
5. Connect a vacuum gauge to the HP EGR Cooling Bypass Solenoid outlet nozzle.
6. Using a jumper wire connected to ground, back probe the HP EGR Bypass Valve (K670) Signal circuit.

Does the vacuum gauge detect any vacuum at the HP EGR Cooling Bypass Solenoid outlet nozzle?

Yes

- Go To [**5**](#)

No

- Replace the HP EGR Cooler Bypass Valve Solenoid in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. INSPECT THE HP EGR COOLER FOR AN INTERNAL ISSUE

1. Turn the ignition off.
2. Inspect the HP EGR Cooler for a blockage and/or a internal bypass flap operation issue.

Were any issues found with the HP EGR Cooler internally?

Yes

- Replace the HP EGR Cooler in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. INSTALL A NEW HP EGR COOLING BYPASS VALVE ACTUATOR AND RETEST FOR DTC

1. Install a new HP EGR Cooling Bypass Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Start the engine and test drive the vehicle.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Installing a new HP EGR Cooling Bypass Valve Actuator repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P26F3-00-STARTER RELAY 2 STUCK OFF

For a complete STARTING/CHARGING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Engine Stop/Start (ESS) system utilizes two Starter Relays to operate the Engine Starter Motor. The Body Control Module (BCM) controls one relay with a Low Side Driver (LSD). When the BCM controlled relay is energized, it provides Ground to the other Starter Relay controlled by the Powertrain Control Module (PCM). The PCM controls engine cranking by energizing the second Starter Relay. The Starter Motor can be disengaged by de-energizing either relay. **The relay names and DTC descriptions may not match and can be confusing. In the PCM diagnostics, the relay controlled by the PCM is always considered starter relay 1 and the BCM controlled relay is considered starter relay 2.**

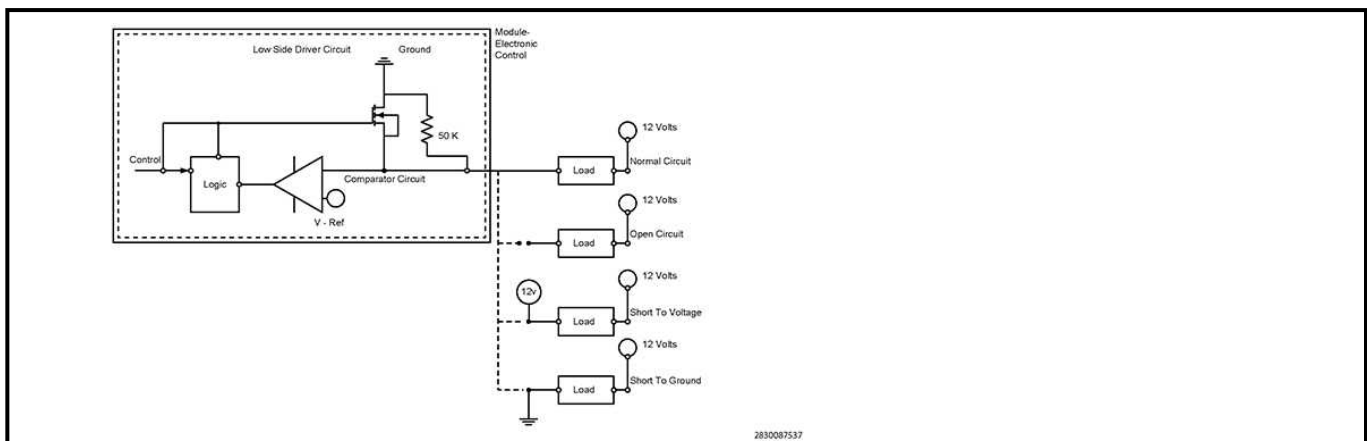
The control circuits for both relays are monitored for circuit faults. The PCM also monitors and performs diagnostics on the output to the Starter Motor on the Ignition Crank Sense circuit. In addition to the control circuit diagnostics for each relay, the PCM also performs diagnostics to detect if one of the relays is stuck in the closed position.

- **Ignition Crank Sense Diagnostics:** The PCM monitors the Ignition Crank Sense circuit voltage when engine cranking is commanded. The Ignition Crank Sense circuit is connected to the Starter Solenoid Feed circuit inside the PDC. During an engine cranking event the PCM expects to see Battery voltage at the Ignition Crank Sense circuit. If no voltage is detected a fault is set.
- **Stuck Relay Diagnostic:** After the engine is initially started, the Powertrain Control Module (PCM) will command one of the Starter Relays closed and the other Starter Relay open and monitor the Ignition Crank Sense circuit for voltage. It will then open the closed relay and close the open relay and monitor the Ignition Crank Sense circuit for voltage. If there is voltage present on the feedback circuit during either of these tests, then the relay that was commanded off when voltage was detected is determined to be stuck closed and a performance fault is set against that relay.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The ground could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:

- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull down resistor** connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage. **An alternative method of fault detection for an open or short to ground** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open. Excessive current draw detected would indicate a short to ground.
- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

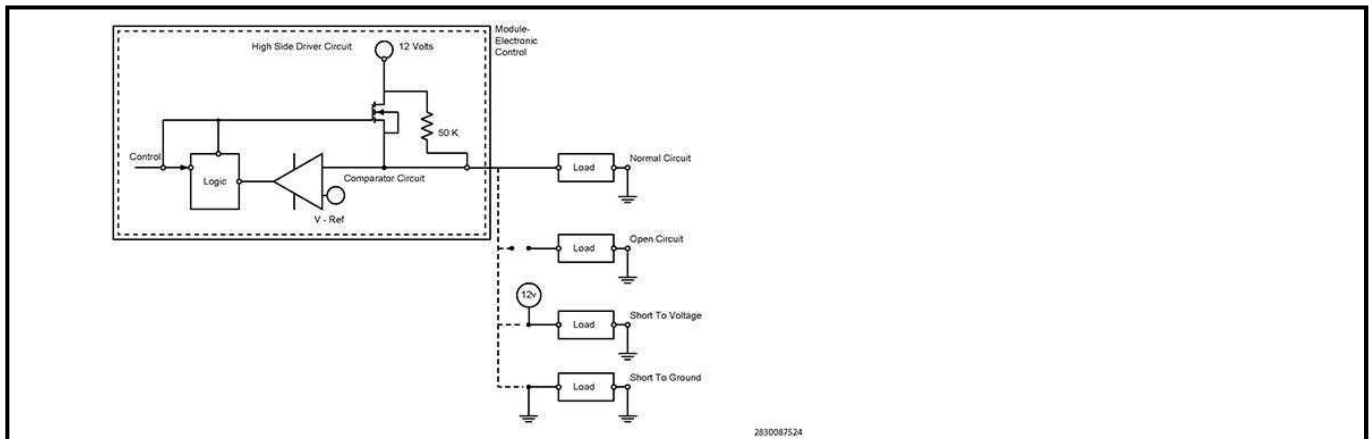
NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.



Typical High Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides 12 volts to operate the device when switched on. The voltage could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. The graphic shows how the PCM performs diagnostics using an internal pull up diagnostic resistor and calibrated voltage reference (V-Ref) as a comparator for fault detection.

- **Circuit Open and Circuit High Detection:** The PCM monitors for an **open circuit** and **short to voltage** when the internal driver is switched off. A milliamperage voltage is provided to the device through the **internal pull up diagnostic resistor** connected in series with the device. The diagnostic voltage is monitored between the pull up resistor and device, and compared to V-Ref. If the resistance in the device or circuitry becomes too large (approaches open) the voltage supply will increase on the **comparator circuit** and become greater than V-Ref, and a fault is detected. A short to Battery voltage will have the same effect. **An alternative method of fault detection for an open** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open.
- **Circuit Low Detection:** The PCM monitors for a **short to ground** when the driver is turned on. When switched on, the voltage to the device should be close to the 12 volt supply voltage. A short to ground will pull the voltage at the **comparator circuit** below V-Ref and a circuit low fault is detected. **An alternative method of fault detection for a short to ground** that is used is to monitor current draw

when the internal driver is switched on. Excessive current draw detected would indicate a short to ground.



WHEN MONITORED

This diagnostic runs continuously conditions are met:

- With the ignition on.
- Battery voltage above 11.0 volts.
- Vehicle is not in an auto start event.

SET CONDITION

- The PCM determines that the difference between the Auxiliary Battery system voltage and the charging system output voltage is greater than 2.0 volts.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OPEN CHARGING SYSTEM FUSE IN THE POWER DISTRIBUTION CENTER
PCR CONTROL RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
POOR CONNECTION AT THE AUXILIARY BATTERY POSITIVE OR NEGATIVE CABLE ENDS
HIGH RESISTANCE IN THE AUXILIARY BATTERY POSITIVE CABLE
HIGH RESISTANCE IN THE AUXILIARY BATTERY GROUND
HIGH RESISTANCE IN THE FUSED B+ CIRCUIT TO THE PCM
PCR CONTROL RELAY (ON PCB INSIDE PDC) IS STUCK ON
POWER CONTROL RELAY (PCR) STUCK ON (OPEN)
FAULTY AUXILIARY BATTERY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. CHECK FOR OTHER DTCS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.

Are there any PCR Control Relay Control circuit or Charging system DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FUSES N7 (300A) AND N3 (150A) IN THE POWER DISTRIBUTION CENTER

1. Check Fuse N7 and N3 in the Power Distribution Center for continuity.

Is the Fuse open?

Yes

- Replace the open fuse and check the related wiring harnesses for any conditions that could cause the open fuse.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE POWER CONTROL RELAY (T760) CONTROL CIRCUIT FOR VOLTAGE AT THE POWER CONTROL RELAY

1. Turn the ignition off.
2. Disconnect the Power Control Relay C1 harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the Power Control Relay (T760) Control circuit at the Power Control Relay C1 harness connector.

NOTE: There should be no voltage present since the Power Control Relay is only energized during an auto start event.

Is there any voltage present?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. CHECK THE POWER CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER VOLTAGE SUPPLY CIRCUIT AT THE PDC CONNECTOR

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) harness connector.
3. Check for continuity between the Power Control Relay (T760) Control circuit and all other circuits at the PDC harness connector.

Is there continuity between the Power Control Relay (T760) Control circuit and any other circuit?

Yes

- Repair the Power Control Relay (T760) Control circuit for a short to the circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Power Distribution Center in accordance with the Service Information. Refer to [CENTER, POWER DISTRIBUTION \(PDC\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE POWER CONTROL RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Remove the eyelet from the Power Control Relay C2 terminal. Leave the C3 eyelet connected to the Power Control Relay.

NOTE: This eyelet is still connected to Main Cranking Battery. Be careful to insulate and/or isolate the cable so that it cannot make contact with any engine ground.

3. Measure the voltage at the C2 terminal of the Power Control Relay with the C2 eyelet removed and the C3 eyelet still connected.

NOTE: The Power Control Relay is normally closed when not energized and should have voltage passing through the relay from the C3 terminal to the C2 terminal.

Is voltage present at the C2 terminal?

Yes

- Go To [7](#)

NOTE: Reconnect the eyelet to the Power Control Relay before continuing.

No

- Replace the Power Control Relay in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK (A702) CIRCUIT BETWEEN THE POWER CONTROL RELAY AND THE PDC

1. Perform a voltage drop test on the (A702) Fused B+ circuit between the PDC and the Power Control Relay C2 terminal.

Is the voltage drop less than 0.2 volts?

Yes

- Go To [8](#)

No

- Repair the (A702) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK AUXILIARY BATTERY POSITIVE CABLE BETWEEN THE POWER CONTROL RELAY AND THE AUXILIARY BATTERY

1. Perform a voltage drop test on the Auxiliary Battery (A0) Fused B+ Cable between the cable end at the Auxiliary Battery post and the Power Control Relay C3 terminal.

Is the voltage drop less than 0.2 volts?

Yes

- Go To [9](#)

No

- Repair the Auxiliary Battery Positive Cable for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK MAIN BATTERY POSITIVE CABLE BETWEEN THE POWER CONTROL RELAY AND THE PDC

1. Perform a voltage drop test on the Auxiliary Battery (A1) Fused B+ Cable between the cable end at the Main Battery post and the PDC connector.

Is the voltage drop less than 0.2 volts?

Yes

- Go To [10](#)

No

- Repair the Main Battery Positive Cable for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK AUXILIARY BATTERY POSITIVE AND NEGATIVE CABLE CONNECTIONS

1. Perform a voltage drop test between the Battery Cable ends and the Battery posts on the Auxiliary Battery.

Is the voltage drop less than 0.2 volts for both cables?

Yes

- Go To [11](#)

No

- Clean the Battery Cables and posts.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK THE AUXILIARY BATTERY STATE OF CHARGE

1. Disconnect the Negative Cable from the Auxiliary Battery.
2. Use the (special tool #GR8-1220KIT-CHRY, AGM Battery Tester/Charger Station) or equivalent to load test the Auxiliary Battery.

Did the Auxiliary Battery pass the load test?

Yes

- Go To [12](#)

No

- Recharge or replace the Auxiliary Battery and retest.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK AUXILIARY BATTERY NEGATIVE CABLE GROUND

1. Check the Auxiliary Battery Negative Cable for a proper ground.

Is the Negative Battery Cable grounded properly?

Yes

- Go To [13](#)

No

- Repair the Auxiliary Battery Negative Cable ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

13. CHECK AUXILIARY BATTERY POSITIVE CABLE

1. Reconnect the Negative Cable to the Auxiliary Battery.
2. Perform a voltage drop test on the Auxiliary Battery Positive Cable between the cable end at the Auxiliary Battery post and the Remote Positive Jump Post connection.

Is the voltage drop less than 0.25 volts?

Yes

- Go To [14](#)

No

- Repair the Auxiliary Battery Positive Cable for high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

14. CHECK (A106) FUSED B+ SUPPLY VOLTAGE TO THE PCM

1. Back probe and measure the voltage on the (A106) Fused B+ circuit at the GPEC Adaptor.
2. Measure the Voltage of the Auxiliary Battery.

Is the Voltage on the (A106) Fused B+ circuit within 0.2 volts of the Auxiliary Battery?

Yes

- Go To [15](#)

No

- Repair the (A106) Fused B+ circuit for high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

15. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2A00-00-O2 SENSOR 1/1 CIRCUIT PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the dynamics of the O2 Sensor signal is too small.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SYSTEM LEAK OR RESTRICTION
EXHAUST SYSTEM LEAK OR RESTRICTION
POOR EGR SYSTEM PERFORMANCE
POOR FUEL SYSTEM PERFORMANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel System or Performance DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR INTAKE SYSTEM LEAK OR RESTRICTION

1. Turn the ignition off.
2. Perform a thorough inspection of the intake system. Look for any leaks or restrictions. Pay special attention to the Charge Air Cooler and hoses.
3. Remove the Mass Air Flow Sensor from the inlet tube.
4. Seal off and/or plug the where the MAF sensor was removed.
5. Connect the smoke machine 84-04 to the intake system where possible and begin injecting smoke into the system.
6. Observe all intake system components for evidence of smoke leakage.

Were any leaks or restrictions found?

Yes

- Repair the leak or restriction in the intake system.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR A LEAK OR RESTRICTION

1. Perform a thorough inspection of the exhaust system. Look for any leaks or restrictions.

Were any leaks or restrictions found?

Yes

- Repair the leak or restriction in the exhaust system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE EGR SYSTEM PERFORMANCE

1. Perform a thorough inspection of the EGR system. Look for signs of a leak or restriction.

Is the EGR system operating properly?

Yes

- Go To [6](#)

No

- Repair the EGR System as needed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK THE FUEL SYSTEM PERFORMANCE

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Is the fuel system operation normal?

Yes

- Go To [7](#)

No

- Repair the fuel system as needed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

7. CHECK THE O2 SENSOR OPERATION

1. Install the Oxygen Sensor in accordance with the Service Information.
2. Connect the PCM C1 harness connector.
3. Connect the O2 Sensor harness connector.
4. Start the engine.

5. Allow the engine to reach normal operating temperature. It may be necessary to test drive the vehicle to confirm repair.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Is the DTC Active?

Yes

- Go To [8](#)

No

- Replace the Oxygen Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2BA9-00-NOX EXCEEDENCE - INSUFFICIENT REDUCTANT QUALITY

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) for quality after every refill event. A refill event means inserting more than one gallon of DEF into the DEF tank. The PCM will not run another monitor (for this DTC) until the next refill event. This DTC will only be active during the drive cycle when the DTC is actually setting. The DTC will remain in 'stored' status for the next 39 key cycles. A message will be displayed on the Electronic Vehicle Information Center (EVIC): "Service DEF System - See Dealer Soon".

This DTC will no longer be displayed after 40 key cycles. But, the Selective Catalyst Reduction (SCR) Inducement message ("Service DEF System - See Dealer Soon") will continue to display periodically until the SCR Healing Procedure is performed so the monitor runs again. There may be repairs made per other system DTCs (shown below). There may be repairs recommended per this DTC. Or, there may be no repairs indicated at all. All scenarios must end with the SCR Healing Procedure (shown in P2BA9-00-Test Step 7).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The PCM runs this monitor after every Diesel Exhaust Fluid (DEF) refill event.
- NOx Sensors are active.
- Ambient temperature exceeding -7.0B°C (19.4B°F).
- Altitude is lower than 6, 800 feet.
- Vehicle has been driven at steady highway speeds for a sufficient amount of time.

SET CONDITION

- The PCM uses the (upstream) NOx Sensor 1/1 and the (downstream) NOx Sensor 1/2 feedback to calculate the NOx efficiency. The PCM also factors in engine operating and environmental conditions to calculate the DEF dosing rate. The PCM sets this DTC if the NOx Conversion Efficiency is below a calculated threshold target.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OTHER SELECTIVE CATALYTIC REDUCTION (SCR), DEF, OR NOX DTCS PRESENT
DEF CONTAMINATION
DEF SUPPLY LINE RESTRICTION
SCR CATALYST
DEF INJECTOR
DEF SUPPLY PUMP
SCR HEALING PROCEDURE REQUIRED (TEST STEP 7)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any SCR, DEF, or NOx DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **[3.0L DIESEL - DIAGNOSTIC CODE INDEX](#)** .

No

- Go To [3](#)

3. CHECK FOR DIESEL EXHAUST FLUID LEAK

1. Turn the ignition on.
2. With the scan tool, navigate to Systems Tests and actuate the DEF Injector (Dosing Valve) Actuator Test.

NOTE: This will pressurize the system, making a leak easier to see.

3. Inspect for signs of a Diesel Exhaust Fluid leak at:

- DEF Injector and Injector connectors.
- DEF Heater Line.
- DEF Supply Pump Assembly.

NOTE: Diesel exhaust fluid will form white deposits around leaky fittings.

Were any leaks found?

Yes

- Repair or replace the faulty component in accordance with the Service Information.
- Then, go back to the beginning of the Diagnostic Tree for this DTC (P2BA9-00) and start over.

No

- Go To [4](#)

4. CHECK THE DEF QUALITY

1. Turn the ignition off.
2. Test the quality of the Diesel Exhaust Fluid. Refer to Diesel Exhaust Fluid Emissions, Diagnosis and Testing. Refer to **[DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING](#)**.

Were there any problems found with the quality of the Diesel Exhaust Fluid?

Yes

- Drain and refill the DEF tank with the correct application Diesel Exhaust Fluid.
- **IMPORTANT: THE SCR HEALING PROCEDURE (TEST STEP 7) MUST NOW BE PERFORMED.**
- Go To [8](#)

No

- Go To [5](#)

5. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.

NOTE: Leave the DEF Injector harness connector attached to the DEF Injector.

3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the SCR Catalyst in accordance with the Service Information.

- **IMPORTANT: THE SCR HEALING PROCEDURE (TEST STEP 7) MUST NOW BE PERFORMED.**
- Go To [8](#)

No

- **If above 35 ml:** Replace the DEF Injector in accordance with the Service Information.
- **IMPORTANT: THE SCR HEALING PROCEDURE (TEST STEP 7) MUST NOW BE PERFORMED.**
- Go To [8](#)
- **If below 26 ml:** Check the DEF supply lines for a restriction
- Go To [6](#)

6. CHECK THE DEF SUPPLY LINE FOR A RESTRICTION

1. Check the DEF Supply line for a restriction.

Was there a restriction in the DEF Supply line?

Yes

- Replace the DEF Supply line in accordance with the Service Information.
- **IMPORTANT: THE SCR HEALING PROCEDURE (TEST STEP 7) MUST NOW BE PERFORMED.**
- Go To [8](#)

No

- Go To [7](#)

7. CHECK THE DEF INJECTOR OPERATION

1. Install the DEF Injector in accordance with the Service Information.

NOTE: At this time, the DEF Volume test must be performed again.

2. Turn ignition off.
3. Remove the DEF Injector from the decomposition tube.

NOTE: Leave the DEF Injector harness connector attached to the DEF Injector.

4. Place the DEF Injector in a container to capture the fluid sprayed.
5. Turn the ignition on.
6. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

7. Measure the amount of fluid sprayed after the test times out.

Is the DEF Volume test result still below 26 ml?

Yes

- Replace the DEF Supply Pump in accordance with the Service Information.
- **IMPORTANT: THE SCR HEALING PROCEDURE (TEST STEP 7) MUST NOW BE PERFORMED.**
- Go To [8](#)

No

- Go To [8](#)

8. PERFORM THE SCR HEALING PROCEDURE

1. Verify that the DEF Tank level is between 25% and 85% full.
2. Please turn the key off for 45 seconds (Complete after-run).
3. Using the scan tool, go Misc. Functions>Perform 'DEF Tank Level Reset'.
4. Add 1 gallon of Diesel Exhaust Fluid (to trigger refill detection).

NOTE: The ambient air temperature must be above -7.0B°C (19.4B°F) to continue with this procedure.

NOTE: The vehicle must be below 6, 800 ft. altitude to continue with this procedure.

5. At this time, perform a Service Regeneration procedure (see Sect. 11-Exhaust>FILTER, Diesel Particulate).

NOTE: This will prevent DPF Regeneration from occurring during the rest of the Healing Procedure.

6. With the vehicle at full operating temperature, (Using the scan tool) Verify that the DEF system has pressurized.
7. Drive the vehicle at steady highway speeds until the Inducement message on the Cluster is no longer present.

NOTE: Typically a drive of 55 MPH or higher on a highway for 60 minutes should be sufficient.

8. The 'Service DEF' message on the EVIC will turn off when this DTC has been successfully healed.

Did the "Service DEF" message turn off?

Yes

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

Perform the SCR HEALING PROCEDURE again.

P2B99-00-EXHAUST PRESSURE CONTROL VALVE A DRIVER CURRENT/TEMPERATURE TOO HIGH

For a complete EGR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The PCM detects an over current in the motor circuits for the Exhaust Bypass Valve Actuator.

DEFAULT ACTION

- The MIL is illuminated on the second consecutive trip that the diagnostic fails.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS VALVE ACTUATOR MOTOR (+) SHORTED TO GROUND
EXHAUST BYPASS VALVE ACTUATOR MOTOR (-) SHORTED TO GROUND
EXHAUST BYPASS VALVE POSITION SENSOR SIGNAL SHORTED TO ANOTHER CIRCUIT
EXHAUST BYPASS VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K675) MOTOR (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as

a guide to follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K676) MOTOR (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K665) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

CAUTION:

Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.

1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE:

With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. REPLACE THE EXHAUST BYPASS VALVE ACTUATOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Bypass Valve Actuator in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty Exhaust Bypass Valve Actuator repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

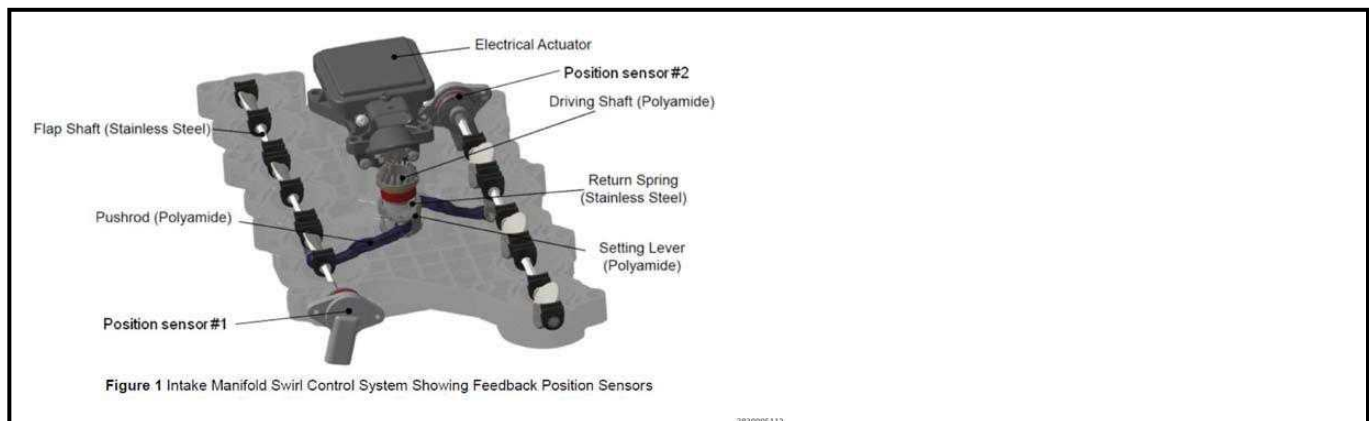
- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2D2D-00-COLD START INTAKE MANIFOLD RUNNER PERFORMANCE BANK 1

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .



THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- 60 seconds after Engine start-up.

SET CONDITION

- The Powertrain Control Module (PCM) detects that a comparison of the Intake Swirl Valve Desired and Measured Positions on Bank 1 (Cylinders 4, 5, & 6) are outside of a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 1
INTAKE SWIRL VALVE (INTAKE MANIFOLD)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, Swirl Valve Actuator, or other Position Sensor 1 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Replace the Intake Manifold and Intake Swirl Valve in accordance with the Service Information.
2. Turn the ignition on.
3. Erase the DTC(s).
4. Start the engine and allow it to idle for up to two minutes.
5. Stop the engine. Leave the ignition on.
6. Using the scan tool, actuate the Intake Swirl Valve by running a full sweep from full closed (5%) to full open (75%).
7. Using the scan tool, view DTCs.

Did the DTC return as Active or Pending?

Yes

NOTE: Before replacing the Intake Manifold, check for excessive buildup or coking in the Intake Manifold that may be causing the Intake Swirl Valve to stick or bind. Also inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Go To [4](#)

No

- Replacing the Intake Manifold and Intake Swirl Valve Position Sensor 1 repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

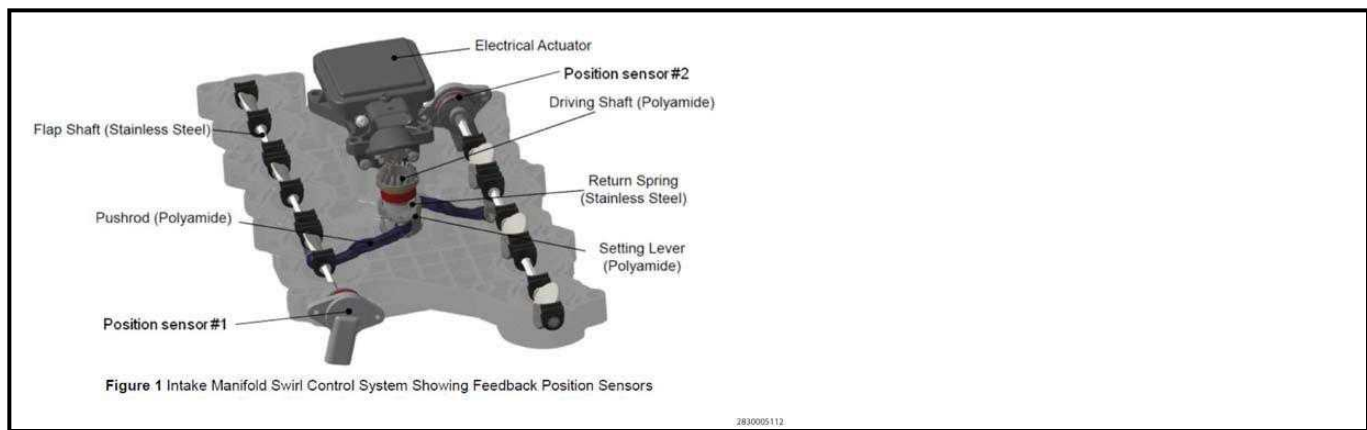
- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2D2E-00-COLD START INTAKE MANIFOLD RUNNER PERFORMANCE BANK 2

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .



THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- 60 seconds after Engine start-up.

SET CONDITION

- The Powertrain Control Module (PCM) detects that a comparison of the Intake Swirl Valve Desired and Measured Positions on Bank 2 (Cylinders 1, 2, & 3) are outside of a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 2

Possible Causes

INTAKE SWIRL VALVE (INTAKE MANIFOLD)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, Swirl Valve Actuator, or other Position Sensor 1 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Replace the Intake Manifold and Intake Swirl Valve in accordance with the Service Information.
2. Turn the ignition on.
3. Erase the DTC(s).
4. Start the engine and allow it to idle for up to two minutes.
5. Stop the engine. Leave the ignition on.
6. Using the scan tool, actuate the Intake Swirl Valve by running a full sweep from full closed (5%) to full open (75%).
7. Using the scan tool, view DTCs.

Did the DTC return as Active or Pending?

Yes

NOTE: Before replacing the Intake Manifold, check for excessive buildup or coking in the Intake Manifold that may be causing the Intake Swirl Valve to stick or bind. Also inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Go To [4](#)

No

- Replacing the Intake Manifold and Intake Swirl Valve Position Sensor 1 repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2D2F-00-TURBOCHARGER-SUPERCHARGER -A- UNDERBOOST CONDITION

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The PCM detects there is an underboost condition when various sensor inputs indicate there should be a specific amount of boost from the Turbocharger during various conditions, but the Boost Pressure Sensor value is below those expectations. There are many possible reasons for this condition (listed in the Possible Causes Table below).

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0299-00 monitor when there is an underboost occurrence during the SHU mode.

The PCM uses the P2D2F-00 monitor when there is an underboost occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when underboost is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Powertrain Control Module (PCM) is attempting to govern Turbocharger boost pressure.

SET CONDITION

- The Boost Pressure Sensor indicates the actual Turbocharger boost is less than the Powertrain Control Module (PCM) set point for engine boost for a calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
RESTRICTED AIR FILTER
AIR CLEANER BOX DAMAGED, OUT-OF-POSITION, AND/OR NOT SEALED PROPERLY
INTAKE AIR SYSTEM LEAKS OR RESTRICTIONS PRESENT SUCH AS ICE OR WATER
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
TURBO ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
TURBO ACTUATOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
BOOST PRESSURE SENSOR
TURBOCHARGER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, using the scan tool, run and save a Vehicle Scan Report, Freeze frame Data, and any other recorded information available.
3. With the scan tool, erase all DTCs.
4. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
7. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel System, EGR, CAC, Intake Air, or Turbocharger-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE AIR FILTER AND THE AIR CLEANER BODY FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Check the Air Cleaner Body for cracks, out of position, improperly secured lid, or other damage.
3. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE INTAKE AIR SYSTEM FOR ICE BUILD UP OR WATER RESIDUE

NOTE: Ice build up or water residue in the Intake Air System can cause this DTC to set.

NOTE: The Vehicle Owner should be advised to use a Winter Front cover during cold ambient conditions.

1. Inspect all hoses/tubes and connections within the Intake Air System and Turbocharger for ice build up or water residue. Pay particular attention to the Charge Air Cooler.

Was there any ice build up or water residue in the Intake Air System or Charge Air System?

Yes

- Thaw out any ice, remove any water residue. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
- If the DTC still returns as Active or Pending: Go To [5](#)
- If the DTC does not return: Removing the ice and water repaired the condition. Advise the Vehicle Owner to use a Cold Weather Front End Cover during cold ambient temperatures.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. VISUALLY INSPECT THE INTAKE AIR SYSTEM, CHARGE AIR COOLER AND EGR AIRFLOW CONTROL VALVE FOR LEAKS OR RESTRICTIONS

NOTE: Damaged, restricted, or poorly connected intake air and Turbocharger related tubes can cause this DTC to set.

1. Turn the ignition off.
2. Visually inspect all air intake, crankcase vent and Turbocharger related hoses/tubes and connections for poor fitting, leaks, or restrictions.
3. Visually inspect the Charge Air Cooler hoses/tubes and connections for poor fitting, leaks, or restrictions.

NOTE: The PCM uses the EGR Airflow Control Valve to meter the amount of fresh air entering the Intake Manifold. This metered fresh air controls the amount of surface pressure on the EGR Valve. The PCM uses this method to enhance control over exhaust gas recirculation. The EGR Airflow Control Valve is sometimes called: 'Throttle Valve Actuator (TVA)'.

4. Visually inspect the EGR Air Flow Control Valve to confirm that the valve is not stuck in the closed position.

Were any problems found in the Intake Air System, Charge Air System, or EGR Airflow Control Valve system?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. PERFORM THE INTAKE AIR SYSTEM PRESSURE TEST

1. Perform the Intake Air System Leak Detection procedure found in Engine/Diagnosis and Testing. Refer to [**INTAKE AIR SYSTEM LEAK DETECTION**](#) .

Were any Intake Air System leaks found using the Smart Pressure smoke machine?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECK THE BOOST PRESSURE ACTUATOR CONNECTOR AND TERMINALS

1. Check the Boost Pressure Actuator harness connector for proper connection at the Boost Pressure Actuator.
2. Verify that the connector is completely plugged in and locked prior to disconnecting.
3. Disconnect the Boost Pressure Actuator harness connector and check for pushed out, corroded or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the terminals or properly connect and lock the Boost Pressure Actuator harness connector.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. CHECK THE FUSED ASD RELAY (F343) OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE:

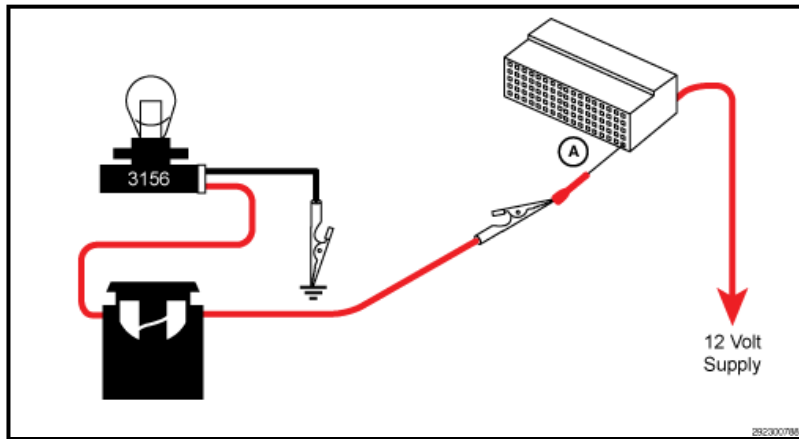
Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES**](#) .**

1. Disconnect the Boost Pressure Actuator harness connector.

CAUTION: Do not load test any circuits with components still connected to the circuit.

2. Turn the ignition on.

3. Load test the Fused ASD Relay (F343) Output circuit at the Boost Pressure Actuator harness connector. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the Boost Pressure Actuator (F343) Output circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

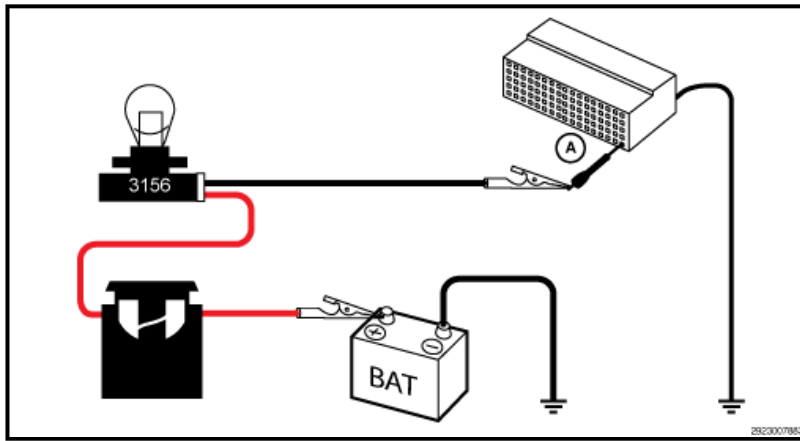
9. CHECK THE (Z908) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

1. Turn the ignition off.

CAUTION: Do not load test any circuits with components still connected to the circuit.

2. Load test the (Z908) Ground circuit at the Boost Pressure Actuator harness connector (A). **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: The PCM uses Pulse-Width Modulation (PWM) to control the position of the Turbo Actuator pushrod. The PCM sends these commands on the K137 circuit. This makes it a 'control' circuit. In the wiring diagrams, it is called a 'signal' circuit.

1. Turn the ignition off.
2. Disconnect the Boost Pressure Actuator harness connector.
3. Disconnect the PCM harness connector.
4. Check the resistance of the Boost Pressure Actuator (K137) Control circuit between the Boost Pressure Actuator harness connector and the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the (K137) Boost Pressure Actuator Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2D30-00-COLD START TURBOCHARGER-SUPERCHARGER -A- OVERBOOST

THEORY OF OPERATION

The PCM detects there is an overboost condition when various sensor inputs indicate there should be a specific amount of boost from the Turbocharger during various conditions, but the Boost Pressure Sensor value is above those expectations. There are many possible reasons for this condition (listed in the Possible Causes Table below).

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0234-00 monitor when there is an underboost occurrence during the SHU mode.

The PCM uses the P2D30-00 monitor when there is an underboost occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when underboost is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Powertrain Control Module (PCM) attempting to govern Turbocharger boost pressure.

SET CONDITION

- The Boost Pressure Sensor indicates actual Turbocharger boost pressure is greater than the PCM set point for engine boost for five seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PLUGGED AIR FILTER
INTAKE/EXHAUST RESTRICTION
INTAKE AIR LEAK
TURBOCHARGER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VISUALLY INSPECT THE AIR FILTER FOR DEBRIS OR RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK FOR AN AIR RESTRICTION IN THE TURBOCHARGER INLET AIR SYSTEM

1. Inspect all air intake, crankcase vent, charge air cooler and Turbocharger related tubes and hoses for damage, restrictions or poor connections or leaks.
2. Inspect the exhaust system and related tubes for damage, restrictions or poor connections.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

U0001-00-CAN C BUS

THEORY OF OPERATION

For an in-depth explanation of the CAN Bus network operation, refer to the DESCRIPTION - COMMUNICATION.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition is on.
- Battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- CAN C bus has experienced a failure due to a circuit or processor fault.

POSSIBLE CAUSES

Possible Causes
OPEN OR SHORTED CAN C BUS CIRCUIT
CAN C RELATED MODULE
CAN C RELATED STAR CONNECTOR (IF EQUIPPED)
CAN C RELATED SPLICE BLOCK CONNECTOR (IF EQUIPPED)

DIAGNOSTIC TEST

1. ATTEMPT TO DUPLICATE THE CONDITION

NOTE: This DTC sets when the CAN C bus is disabled. If the scan tool is able to read this DTC, then the fault is currently NOT active. This diagnostic procedure only troubleshoots an intermittent condition. Follow this procedure to attempt to locate the intermittent condition or induce the fault so the diagnostic procedures under SCAN TOOL DOES NOT COMMUNICATE WITH CAN C can be followed.

1. With the scan tool, run a Vehicle Scan Report and attached it to the repair order.
2. With the scan tool, erase DTCs.
3. Using the Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

Is the fault now present?

NOTE: If the fault is present, the scan tool will not communicate with modules on the CAN C bus.

Yes

- Proceed to SCAN TOOL DOES NOT COMMUNICATE WITH CAN C. Refer to the appropriate diagnostic information.

No

- Go To [2](#)

2. ATTEMPT TO LOCATE AN INTERMITTENT CIRCUIT FAULT

NOTE: The scan tool LOSS OF COMM TEST will force the modules on the CAN C bus to continuously ping each other.

1. With the scan tool, initiate the LOSS OF COMM TEST.

NOTE: A value above 0 under the NUMBER OF NO RESPONSES can help indicate the location of a circuit fault while wiggling the related CAN C bus circuits.

NOTE: The scan tool lag time between pings is almost 1 full second. Keep this in mind while wiggling the wires and connectors.

2. In a systematic manner, wiggle the applicable CAN C circuits at each related module, in-line connector, and Star/Splice Block Connector (if equipped) while monitoring the NUMBER OF NO RESPONSES on the scan tool.

Did the above test help locate the fault?

Yes

- Perform repairs as necessary.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST**.

No

- Go To [3](#)

3. PERFORM VISUAL INSPECTION OF CONNECTORS, TERMINALS AND WIRES

1. Disconnect all CAN C related modules harness connectors.
2. Disconnect all related in-line harness connections.
3. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

4. Reconnect all CAN C related modules harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
5. Reconnect all in-line harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. With the scan tool, erase DTCs.
7. Using the Vehicle Scan Report, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, attempt to communicate with the CAN C bus.

Does the scan tool communicate with the CAN C bus?

Yes

- The conditions that caused this DTC to set are no longer present. Test complete.

No

- Proceed to SCAN TOOL DOES NOT COMMUNICATE WITH CAN C. Refer to the appropriate diagnostic information.

THEORY OF OPERATION

The Electronic Shift Module (ESM) can communicate with the Transmission Control Module (TCM) on the Controller Area Network (CAN) or the Dedicated Powertrain (D-PT) CAN bus. If the ESM loses communication with the TCM on the CAN C bus it will continue to communicate on the D-PT CAN bus and set a DTC against the TCM for CAN C bus off. If the ESM loses communication with the TCM on the CAN-DPT bus it will continue to communicate with the CAN C bus and set a DTC against the TCM for D-PT CAN bus off.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on, off, run, or accessory.
- System voltage is between 10.0 and 16.0 volts.

SET CONDITION

- The ESM loses communication with the Transmission Control Module on the Controller Area Network (CAN) Dedicated Powertrain (DPT) ESHIFT bus.

DEFAULT ACTION

- If CAN C is still functioning:
 - ESM will continue to communicate over the CAN C bus. Customer will not notice any problems with vehicle.
- If both CAN DPT and CAN C are not functioning:
 - Brake Transmission Shift Interlock (BTSI) solenoid will be disabled. (Shifter may be locked in PARK or Neutral.)
 - Gear selection will be disabled.
 - Shift indicator LEDs will be turned on.
 - Shifter background illumination LEDs will be turned off.
- A Stored Diagnostic Trouble Code (DTC) will be cleared after 100 ignition cycles if the failure does not reoccur.

POSSIBLE CAUSES

Possible Causes
CAN DPT ESHIFT CIRCUIT OPEN CIRCUIT
CAN DPT ESHIFT CIRCUIT SHORTED TO GROUND
CAN DPT ESHIFT CIRCUIT SHORTED TO VOLTAGE
ELECTRONIC SHIFT CONTROL MODULE (ESM)
TRANSMISSION CONTROL MODULE (TCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. With the scan tool, read ESM DTCs and record on the repair order.
2. Record the Event Data and Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.

5. With the scan tool, read ESM DTCs and record on the repair order.

Did the DTC return?

Yes

- Go To [2](#)

No

- Go To [6](#)

2. CHECK THE CONTROLLER AREA NETWORK (CAN) DEDICATED POWERTRAIN (DPT) ESHIFT CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the ESM harness connector.
3. Turn the ignition on.
4. Measure the voltage between ground and the CAN DPT ESHIFT (+) circuit at the ESM harness connector.
5. Measure the voltage between ground and the CAN DPT ESHIFT (-) circuit at the ESM harness connector.

Is the voltage between 2.4 and 2.6 volts for each circuit?

Yes

- Using the schematics as a guide, check the Electronic Shift Module (ESM) connector and all related in-line connector terminals for corrosion, damage, or pushed out terminals. Pay particular attention to the power and ground circuits. If no problems are found, replace the ESM in accordance with the Service Information. Refer to [MODULE, ELECTRONIC SHIFT \(ESM\), REMOVAL AND INSTALLATION](#) .
- Perform the ESM VERIFICATION TEST. Refer to [ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK CAN DPT ESHIFT CIRCUITS FOR AN OPEN

1. Turn the ignition off.
2. Disconnect the TCM harness connector.
3. Measure the resistance of the CAN DPT (+) circuit between the ESM harness connector and the TCM harness connector.
4. Measure the resistance of the CAN DPT ESHIFT (-) circuit between the ESM harness connector and the TCM harness connector.

Is the resistance below 3.0 Ohms for each circuit?

Yes

- Go To [4](#)

No

- Repair the affected CAN DPT ESHIFT circuit(s) for an open or high resistance.
- Perform the ESM VERIFICATION TEST. Refer to [ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST](#) .

4. CHECK CAN DPT ESHIFT CIRCUITS FOR A SHORT TO GROUND

1. Check for continuity between ground and the CAN DPT ESHIFT (+) circuit at the TCM harness connector.
2. Check for continuity between ground and the CAN DPT ESHIFT (-) circuit at the TCM harness connector.

Is there continuity between ground and the either of the CAN DPT ESHIFT circuits?

Yes

- Repair the affected CAN DPT ESHIFT circuit(s) for a short to ground.
- Perform the ESM VERIFICATION TEST. Refer to [**ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK CAN DPT ESHIFT CIRCUITS FOR A SHORT TO ANOTHER CIRCUIT

1. Check for continuity between the CAN DPT ESHIFT (+) circuit and all other circuits at the TCM harness connector.
2. Check for continuity between the CAN DPT ESHIFT (-) circuit and all other circuits at the TCM harness connector.

Is there continuity between either CAN DPT ESHIFT circuit and any other circuit?

Yes

- Repair the affected CAN DPT ESHIFT circuit(s) for a short to another circuit.
- Perform the ESM VERIFICATION TEST. Refer to [**ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST**](#) .

No

- Using the schematics as a guide, check the Electronic Shift Module (ESM) connector and all related in-line connector terminals for corrosion, damage, or pushed out terminals. Pay particular attention to the power and ground circuits. If no problems are found, replace the ESM in accordance with the Service Information. Refer to [**MODULE, ELECTRONIC SHIFT \(ESM\), REMOVAL AND INSTALLATION**](#) .
- Perform the ESM VERIFICATION TEST. Refer to [**ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST**](#) .

6. CHECK WIRING AND CONNECTORS

1. The conditions necessary to set the DTC are not present at this time.
2. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
3. Wiggle the wires while checking for shorted and open circuits.
4. Check for any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the ESM VERIFICATION TEST. Refer to [**ELECTRONIC SHIFT MODULE \(ESM\) VERIFICATION TEST**](#) .

No

- Test complete.

U0101-00-LOST COMMUNICATION WITH TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0102-00-LOST COMMUNICATION WITH TRANSFER CASE CONTROL MODULE / AWD

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0103-00-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0104-00-LOST COMMUNICATION WITH CRUISE CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0106-00-LOST COMMUNICATION WITH GLOW PLUG CONTROL MODULE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Glow Plug Module for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GENERATOR
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT SHORTED TO VOLTAGE

Possible Causes
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND
GLOW PLUG MODULE GROUND CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Turn the ignition off. Leave the ignition off for 5 minutes.
4. Start the engine.
5. Allow the engine to run for 2 minutes.
6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

2. CHECK THE GENERATOR FOR PROPER OPERATION

1. Turn the ignition off. Leave it off for 5 minutes.
2. Disconnect the Generator Module harness connector.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Crank the engine for no more than 10 seconds if it will not start.
6. With the scan tool, select View DTCs.

Is DTC P0683-00, U0106-00, or U0407-00 active?

Yes

- If it is this DTC that reset, Go To [3](#)
- If it is one of the other two DTCs that reset, perform the Diagnostics for those DTCs before continuing with this one.

No

- Replace the Generator in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE PCM C1 CONNECTOR HARNESS

1. Turn the ignition off.
2. Disconnect the Glow Plug Module harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D511) LIN Bus circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [4](#)

No

- Repair the (D511) LIN Bus circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D511) LIN Bus circuit at the Glow Plug Module harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the (D511) LIN Bus circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN Bus circuit between the Glow Plug Module harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D511) LIN Bus circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE (F343) ASD SUPPLY CIRCUIT, (A29) FUSED B+ CIRCUIT AND THE (Z909) GLOW PLUG MODULE GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the engine on.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector. Then, measure the voltage across the

(A29) Fused B+ circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit or the (A29) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK THE GLOW PLUG MODULE WIRE HARNESS AND CONNECTORS FOR DAMAGE

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug Module and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [8](#)

8. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Replace the Glow Plug Module in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Turn the ignition off. Leave the ignition off for 5 minutes.
5. Start the engine.
6. Allow the engine to run for 2 minutes.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [9](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U010C-00-LOST COMMUNICATION WITH TURBOCHARGER CONTROL MODULE

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Boost Pressure Actuator is an electronically operated DC motor designed to regulate the boost pressure output of the turbocharger. the boost pressure actuator is mounted on the side of the turbocharger assembly. The PCM will run a test to evaluate the response from the boost pressure actuator by commanding the actuator to move through its full position range for a calibrated time. During the test the PCM will evaluate the response based on a calculated characteristic value which is calculated from the exhaust pressure changes seen during the test. This test is only done once per drive cycle while the engine is idling and the engine coolant temperature is above 75B°C (167B°F).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Turbocharger Boost Actuator for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DATA LINK (-) CIRCUIT SHORTED TO VOLTAGE
LOW DATA LINK (-) CIRCUIT SHORTED TO GROUND
LOW DATA LINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATA LINK (+) CIRCUIT SHORTED TO VOLTAGE
HIGH DATA LINK (+) CIRCUIT SHORT TO GROUND
HIGH DATA LINK (+) CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

2. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the Turbocharger Boost Actuator harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D468) Low Data Link (-) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [3](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D468) Low Data Link (-) circuit at the Turbocharger Boost Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D468) Low Data Link (-) circuit between the Turbocharger Boost Actuator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D468) Low Data Link (-) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Measure the resistance between the (D469) High Data Link (+) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [6](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D469) High Data Link (+) circuit at the Turbocharger Boost Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Data Link (+) circuit between the Turbocharger Boost Actuator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D469) High Data Link (+) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (F343) ASD SUPPLY CIRCUIT AND THE (Z909) TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the engine on.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) HCU Ground circuit at the Turbocharger Boost Actuator harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Turbocharger Boost Actuator and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK THE TURBOCHARGER BOOST ACTUATOR FOR PROPER OPERATION

1. Replace the Turbocharger in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

U0120-00-LOST COMMUNICATION WITH STARTER/GENERATOR CONTROL MODULE WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Generator.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
12-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT SHORTED TO VOLTAGE
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE

Possible Causes
ACTIVE GRILL SHUTTER MODULE (IF EQUIPPED)
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

2. CHECK THE (A801) 12-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.

NOTE: The 12-Volt Supply circuit to the Generator is a B+ circuit. The voltage supply comes directly from the Battery through a Maxi-Fuse located near the Battery.

2. With a 12-volt test light connected to ground, check the (A801) 12-Volt Supply circuit at the Generator B+ post.

Does the test light illuminate as brightly as a direct probe of the Battery?

Yes

- Go To [3](#)

No

- Repair the (A801) 12-Volt Supply circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Turn the ignition off.
2. Unplug the Glow Plug Module.
3. Turn the ignition on.
4. With the scan tool, select View DTCs.

Did the DTC remain active?

Yes

- Go To [4](#)

No

- Replace the Glow Plug Module in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE ACTIVE GRILL SHUTTER MODULE (IF EQUIPPED) FOR PROPER OPERATION

1. Turn the ignition off.
2. Unplug the Active Grill Shutter Module (if equipped).
3. Turn the ignition on.
4. With the scan tool, select View DTCs.

Did the DTC remain active?

Yes

- Go To [5](#)

No

- Replace the Active Grill Shutter Module in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Generator C1 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Remove the ASD Relay.
5. Connect a jumper between terminal 30 and terminal 87.
6. Turn the ignition on.
7. Measure the voltage of the (D511) LIN BUS circuit at the Generator C1 harness connector.

Is there any voltage present?

Yes

- Repair the (D511) LIN BUS circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper.
3. Reinstall the ASD Relay.
4. Measure the resistance between ground and the (D511) LIN BUS circuit at the Generator C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D511) LIN BUS circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN BUS circuit between the Generator C1 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the (D511) LIN BUS circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE GENERATOR FOR PROPER OPERATION

1. Replace the Generator in accordance with the Service Information.
2. Reconnect the PCM C1 harness connector.
3. Reconnect the Generator C1 harness connector.
4. Start the engine.
5. Allow the engine to reach normal operating temperature.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [9](#)

No

- Test complete
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0151-00-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0164-00-LOST COMMUNICATION WITH HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P025B-00 T0P0406-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P025B-00-FUEL PUMP MODULE CONTROL CIRCUIT PERFORMANCE

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) received a message that the Fuel Pump Control Module Pulse Width Modulated (PWM) Feedback circuit voltage is outside a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP CONTROL MODULE CONTROL CIRCUIT LOOSE CONNECTIONS OR HIGH RESISTANCE
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT OPEN/HIGH RESISTANCE
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT SHORTED TO GROUND
FUEL PUMP CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE (N1) FPCM CONTROL CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.
6. Wiggle wiring and fuses in PDC while performing load test.

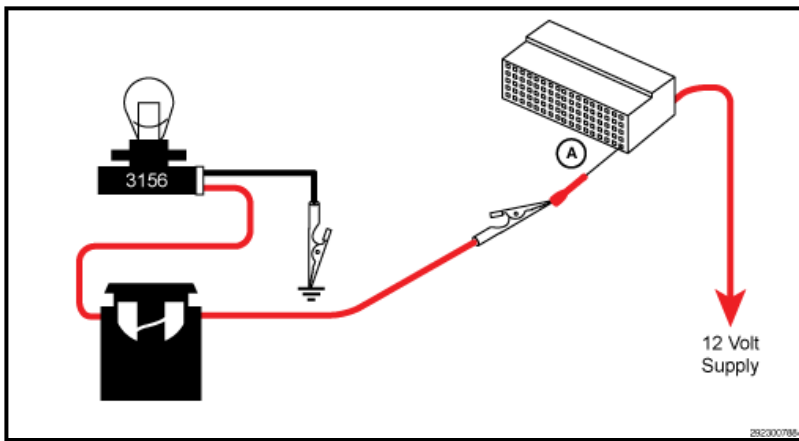
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. REPLACE THE FUEL PUMP CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty Fuel Pump Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P025C-00-FUEL PUMP MODULE CONTROL CIRCUIT LOW

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) received a message that the Fuel Pump Control Module Pulse Width Modulated (PWM) Feedback OR Control circuit voltage is below a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT OPEN/HIGH RESISTANCE
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT SHORTED TO GROUND
FUEL PUMP CONTROL MODULE PWM CONTROL CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
FUEL PUMP CONTROL MODULE PWM CONTROL CIRCUIT SHORTED TO GROUND
FUEL PUMP CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N11) PWM CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N11) PWM CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. REPLACE THE FUEL PUMP CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the faulty Fuel Pump Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

- Repair any conditions that are found.
6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
 7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
 8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
 9. With the scan tool, erase DTCs.
 10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
 11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P025D-00-FUEL PUMP MODULE CONTROL CIRCUIT HIGH

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) received a message that the Fuel Pump Control Module Pulse Width Modulated (PWM) Feedback OR Control circuit voltage is above a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT SHORTED TO VOLTAGE
FUEL PUMP CONTROL MODULE PWM CONTROL CIRCUIT SHORTED TO VOLTAGE
FUEL PUMP CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.
1. to the appropriate PCM harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N11) PWM CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE FUEL PUMP CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0261-00-FUEL INJECTOR 1 CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Refer to the recorded DTCs.

Are there any other DTCs present?

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any issues found.

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that had continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that measures above 1.0 Ohm.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 1 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCS

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCS are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0262-00-FUEL INJECTOR 1 CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS**.

Were any issues found.

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [9](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector 1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCs.
4. Disconnect the Fuel Injector 1 harness connector.
5. With the scan tool, read the PCM DTCs.

NOTE: The continued setting of multiple DTCs indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCs did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCs setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0263-00-CYLINDER 1 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range. The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running for at least five second.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.
3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to **CHECKING THE ENGINE MECHANICAL SYSTEMS** .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: **The new Fuel Injector correction code is located on top of the injector.**

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0264-00-FUEL INJECTOR 2 CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found.

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that does not measures below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCs set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Connect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCs.
4. Disconnect the Fuel Injector 2 harness connector.
5. With the scan tool, read the PCM DTCs.

NOTE: The continued setting of multiple DTCs indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCs did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCs setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Connect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0265-00-FUEL INJECTOR 2 CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: **An open ASD power supply to the PCM will cause multiple DTCS including this DTC to set.**

1. Check the PCM for other DTCS.

Are there any other DTCS present.

Yes

- Go To **3**

No

- Go To **4**

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found.

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE:

Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [9](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector 2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 2 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCS

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCS are not set.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0266-00-CYLINDER 2 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range. The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running for at least five seconds.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.
3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To **3**

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **5**

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to **CHECKING THE ENGINE MECHANICAL SYSTEMS** .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **6**

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: **The new Fuel Injector correction code is located on top of the injector.**

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0267-00-FUEL INJECTOR 3 CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, erase the PCM DTCs.
3. Attempt to start the engine and test drive the vehicle.
4. With the scan tool, read the PCM DTCs.

Did this DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High-Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low-Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that did showed continuity to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 3 in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 3 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0268-00-FUEL INJECTOR 3 CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair the PCM power and ground circuits in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of each Fuel Injector High Side and Low Side Control circuits between its respective injector harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms for each measurement?

Yes

- Go To [8](#)

No

- Repair the Fuel Injector Control circuit that measured above 3.0 Ohms for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [11](#)

No

- Replace the Fuel Injector 3 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 3 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of

multiple DTCs setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0269-00-CYLINDER 3 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range. The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running for at least five seconds.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.
3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Injector DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to [**CHECKING THE ENGINE MECHANICAL SYSTEMS**](#) .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: **The new Fuel Injector correction code is located on top of the injector.**

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P026A-00-CHARGE AIR COOLER EFFICIENCY BELOW THRESHOLD

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Charge Air Cooler (CAC) Temperature Sensor, Inlet Air Temperature, and Ambient Air Temperature Sensor status are valid.

SET CONDITION

- The Powertrain Control Module (PCM) compares the Charge Air Cooler (CAC) Temperature readings to a calibrated threshold. The calibrated threshold varies, and is dependant on the reading from the Ambient Air Temperature (AAT) Sensor. If the rationalized value is above a calibrated threshold for a cumulative total (during a calibrated amount of time), the PCM determines that the Charge Air Cooler is inefficient and sets the DTC.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CHARGE AIR COOLER (CAC) OUT TEMPERATURE SENSOR CHARGE AIR COOLER FINS BLOCKED FROM DEBRIS COOLING FAN FAULTY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any CAC Out Temperature Sensor, Inlet Air Temperature Sensor, Ambient Air Temperature Sensor or Cooling Fan DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE OPERATION OF THE CAC OUT TEMPERATURE SENSOR

1. Turn the ignition off.
2. Disconnect the CAC Out Temperature Sensor harness connector.
3. Remove the CAC Out Temperature Sensor and reconnect the wiring to the sensor.
4. Turn the ignition on.

5. With the scan tool in, monitor the CAC Out Temperature Sensor while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the sensor increase at least 5°F on the scan tool?

Yes

- Go To [4](#)

No

- Replace the Charge Air Cooler (CAC) Out Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. VISUALLY INSPECT THE CHARGE AIR COOLER FOR RESTRICTED AIR FLOW

1. Visually inspect the Charge Air Cooler and Radiator fins for excessive debris restricting air flow through the Charge Air Cooler.

Are the Charge Air Cooler or Radiator restricted with debris?

Yes

- Clean the debris from the Charge Air Cooler or Radiator.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE COOLING FAN OPERATION

1. Check the Cooling Fan operation.

Was the Cooling Fan found to be operating normal?

Yes

- Check for a base engine condition, such as an engine overheat or intake air restriction that could cause the Charge Air Cooler to work inefficiently.
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

No

- Clean the debris from the Charge Air Cooler or Radiator.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P026B-00-INJECTION TIMING PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running, once per Camshaft revolution.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the allotted time for the Fuel Injector to energize has exceeded the calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
ELECTRICAL CONNECTION AT FUEL INJECTOR(S)
FUEL INJECTOR(S)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel System related DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK THE FUEL INJECTORS

1. Inspect the fuel injectors for damage or connection issues.

Are there any issues present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**4**](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P026C-00-FUEL INJECTION QUANTITY LOWER THAN EXPECTED

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) uses a Fuel Mass Observer (FMO) Monitor to check the injection correction quantity for exceeding permissible limits and the fuel mass over a period of time. The FMO activation time monitor checks time to enter closed loop air/fuel ratio control diagnosis.

This is a 5-wire Wideband O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement. The controller keeps adjusting the O2 Sensor model until it follows the measured O2 signal (the difference converges to zero).

The described rationality check will detect fuel injection quantity that is too rich, and excessive time to enter closed loop air/fuel ratio control failure.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) multiplies short term compensation by the long term adaptive. If the PCM calculates that the FMO correction quantity is equal to or less than a calibrated threshold the DTC will set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
AIR RESTRICTIONS
AIR LEAKS
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP ASSEMBLY
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
ENGINE MECHANICAL ISSUE
FUEL FILTER/PRESSURE REGULATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

NOTE: **Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**

Are there any ECT Sensor, EGR, Injector, FRP Sensor, Turbocharger, MAF/Intake Air Sensor, 2 Sensor, or Misfire DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE AIR FILTER FOR EXCESSIVE AIR FLOW RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction

Were any of these problems found?

Yes

- Replace the Air Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE AIR INTAKE SYSTEM FOR AIR RESTRICTIONS

NOTE: Inspect all air intake, crankcase vent and turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

1. Inspect the intake system, exhaust system and related tubes and connections.

Were any intake system, exhaust system problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#).

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Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE ECT SENSOR FOR PROPER OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak)

1. Ignition on, engine not running.
2. With the scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

3. Start the Engine.
4. During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 88°C (190°F).

Did the ECT value increase smoothly and did it reach at least 88°C (190°F)?

Yes

- Go To [7](#)

No

- Verify that there is good pin to terminal contact in the ECT Sensor and Powertrain Control Module connectors. Replace the ECT Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#).

Were any problems found with the fuel system?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE INTAKE AND EXHAUST SYSTEM FOR RESTRICTIONS

1. Turn the ignition off.
2. Inspect the exhaust system for damaged components that could cause exhaust flow blockage.
3. Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections for damage, air leaks or blockage.
4. Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. CHECK THE EGR SYSTEM FOR A LEAK

1. Check for visible signs (soot streaks) of external EGR system leaks around the V-band clamps and connections. Ensure that all torques are within specifications.

Were any EGR system leaks found?

Yes

- Repair as necessary in accordance with the Service Information to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK THE O2 SENSOR FOR EXCESSIVE SOOT BUILDUP

NOTE: Excessive soot build up can be caused by over fueling. If excessive soot build up is present, the fuel system operation should be checked and the O2 sensor should be cleaned.

1. Remove the O2 Sensor.
2. Clean the soot from the O2 Sensor.
3. Reinstall the O2 Sensor.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Turn the ignition off for 75 seconds.
7. Start the engine and drive the vehicle at 50 MPH. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal). Repeat 3-5 times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [11](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK THE ENGINE FOR MECHANICAL PROBLEMS

1. Turn the ignition off.
2. Check for any of the following conditions/mechanical problems:
 - AIR INDUCTION SYSTEM - must be free from leaks.
 - ENGINE VALVE TIMING - must be within specifications
 - ENGINE COMPRESSION - must be within specifications
 - ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
 - ENGINE PCV SYSTEM - must flow freely
 - TORQUE CONVERTER STALL SPEED - must be within specifications
 - FUEL - must be free of contamination
 - FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [12](#)

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P026D-00-FUEL INJECTION QUANTITY HIGHER THAN EXPECTED

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) uses a Fuel Mass Observer (FMO) Monitor to check the injection correction quantity for exceeding permissible limits and the fuel mass over a period of time. The FMO activation time monitor checks time to enter closed loop air/fuel ratio control diagnosis.

This is a 5-wire Wideband O₂ Sensor. This sensor operates differently from traditional O₂ Sensors. The wide-band O₂ Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement. The controller keeps adjusting the O₂ Sensor model until it follows the measured O₂ signal (the difference converges to zero).

The described rationality check will detect fuel injection quantity that is too rich, and excessive time to enter closed loop air/fuel ratio control failure.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running at a steady state between 1200-2300 rpm.

SET CONDITION

- The Powertrain Control Module (PCM) multiplies short term compensation by the long term adaptive. If the PCM calculates that the FMO correction quantity is equal to or greater than a calibrated threshold, a freeze frame is stored, the MIL illuminates, and a DTC is stored. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST LEAKS OR RESTRICTIONS
AIR FILTER
AIR RESTRICTIONS
AIR LEAKS
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
O ₂ SIGNAL CIRCUIT
O ₂ RETURN CIRCUIT
O ₂ SENSOR
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
FUEL INJECTOR STUCK OPEN
MASS AIR FLOW (MAF) SENSOR
ENGINE MECHANICAL
FUEL FILTER/PRESSURE REGULATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any ECT Sensor, EGR, Injector, FRP Sensor, Turbocharger, MAF/Intake Air Sensor, 2 Sensor, or Misfire DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**2**](#)

2. CHECK THE AIR FILTER FOR EXCESSIVE AIR FLOW RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction

Were any of these problems found?

Yes

- Replace the Air Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. CHECK THE AIR INTAKE SYSTEM AND EXHAUST SYSTEMS FOR FLOW RESTRICTIONS

NOTE: Inspect all air intake, crankcase vent and turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

1. Inspect the intake system, exhaust system and related tubes and connections.

Were any intake system, exhaust system problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE INTAKE AIR SYSTEM AND EXHAUST SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#) .

Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE ECT SENSOR FOR PROPER OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak)

1. Ignition on, engine not running.
2. With the scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

3. Start the Engine.
4. During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 88°C (190°F).

Did the ECT value increase smoothly and did it reach at least 88°C (190°F)?

Yes

- Go To [6](#)

No

- Verify that there is good pin to terminal contact in the ECT Sensor and Powertrain Control Module connectors. Replace the ECT Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE EGR SYSTEM FOR A LEAK OR RESTRICTION

1. Check for visible signs (soot streaks) of external EGR system leaks around the V-band clamps and connections. Ensure that all torques are within specifications.

Were any EGR system leaks found?

Yes

- Repair as necessary in accordance with the Service Information to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE O2 SENSOR CIRCUIT

1. Disconnect the O2 Sensor harness connector
2. Check the Fused ASD Relay (F343) output circuit for an open/high resistance.
3. Check the O2 1/1 (K41) Signal circuit for an open/high resistance.
4. Check the O2 1/1 (K902) Return circuit for an open/high resistance.
5. Check the O2 1/1 Positive Current (K89) Control circuit for an open/high resistance.
6. Check the O2 1/1 Heater (K79) Control circuit for an open/high resistance.

Are there any issues with the wiring for the O2 Sensor?

Yes

- Repair the wiring issue.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any problems found with the fuel system?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK THE ENGINE FOR MECHANICAL PROBLEMS

1. Turn the ignition off.
2. Check for any of the following conditions/mechanical problems:
 - AIR INDUCTION SYSTEM - must be free from leaks.
 - ENGINE VALVE TIMING - must be within specifications
 - ENGINE COMPRESSION - must be within specifications
 - ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
 - ENGINE PCV SYSTEM - must flow freely
 - TORQUE CONVERTER STALL SPEED - must be within specifications
 - FUEL - must be free of contamination
 - FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine cranking or running

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High- Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that did showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 4 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 4 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCS

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCS are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0271-00-FUEL INJECTOR 4 CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low-Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [7](#)

7. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [8](#)

8. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [9](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector 4 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 4 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCS

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCS are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0272-00-CYLINDER 4 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range.

The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running for at least five seconds.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.
3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [**CHECKING THE FUEL DELIVERY SYSTEM**](#) .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to [**CHECKING THE ENGINE MECHANICAL SYSTEMS**](#) .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**6**](#)

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.

2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: **The new Fuel Injector correction code is located on top of the injector.**

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0273-00-FUEL INJECTOR 4 CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine cranking or running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN CHECK FOR ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, erase the PCM DTCs.
3. Attempt to start the engine and test drive the vehicle.
4. With the scan tool, read the PCM DTCs.

Did this DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High-Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low-Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that did showed continuity to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 5 in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 5 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCS

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0274-00-CYLINDER 5 INJECTOR CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCS including this DTC to set.

1. Check the PCM for other DTCS.

Are there any other DTCS present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of each Fuel Injector High Side and Low Side Control circuits between its respective injector harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms for each measurement?

Yes

- Go To [8](#)

No

- Repair the Fuel Injector Control circuit that measured above 3.0 Ohms for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [11](#)

No

- Replace the Fuel Injector 5 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCS.
4. Disconnect the Fuel Injector 5 harness connector.
5. With the scan tool, read the PCM DTCS.

NOTE: The continued setting of multiple DTCS indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCS did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCS setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0275-00-CYLINDER 5 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range. The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs

- With the engine running for at least five seconds.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.

3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Injector DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to [CHECKING THE ENGINE MECHANICAL SYSTEMS](#) .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: **The new Fuel Injector correction code is located on top of the injector.**

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0276-00-FUEL INJECTOR 6 CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine cranking or running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and each Fuel Injector High-Side Control circuit.
5. Check for continuity between ground and each Fuel Injector Low-Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and any of the Fuel Injector terminals?

Yes

- Replace the Fuel Injector that did showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [7](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [8](#)

No

- Replace the Fuel Injector 6 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCs.
4. Disconnect the Fuel Injector 6 harness connector.
5. With the scan tool, read the PCM DTCs.

NOTE: The continued setting of multiple DTCs indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCs did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCs setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0277-00-CYLINDER 6 INJECTOR CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Injector Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUITS SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: An open ASD power supply to the PCM will cause multiple DTCs including this DTC to set.

1. Check the PCM for other DTCs.

Are there any other DTCs present.

Yes

- Go To [3](#)

No

- Go To [4](#)

3. CHECK THE PCM POWERS AND GROUNDS

1. Perform the CHECKING THE PCM POWER AND GROUND CIRCUITS test procedure. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any PCM POWER AND GROUND CIRCUIT issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect all of the Fuel Injector harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High Side Control circuit.
8. Measure the voltage of each Fuel Injector Low Side Control circuit.

Is the voltage above 1.0 Volt for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Check for continuity between ground and each Fuel Injector High Side Control circuit.
4. Check for continuity between ground and each Fuel Injector Low Side Control circuit.

Is there continuity between ground and any of the Fuel Injector Control circuits?

Yes

- Repair the Fuel Injector Control circuit that showed continuity for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK FOR FUEL INJECTOR CIRCUITS SHORTED TOGETHER

1. Check for continuity between each of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits.

Is there continuity between any of the Fuel Injector High Side Control circuits and the Fuel Injector Low Side Control circuits?

Yes

- Repair the short between the Fuel Injector circuits that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE FUEL INJECTORS FOR AN INTERNAL SHORT TO GROUND

1. Check for continuity between ground and either terminal of each Fuel Injector.

Is there continuity between ground and either terminal of each Fuel Injector?

Yes

- Replace the Fuel Injector that showed continuity to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE RESISTANCE OF THE FUEL INJECTORS

1. Measure the resistance of each Fuel Injector (measure across both terminals of the injector).

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohms of resistance when measured through it.

Is the resistance below 1.0 Ohm for each Fuel Injector?

Yes

- Go To [9](#)

No

- Replace the Fuel Injector that did not measure below 1.0 Ohm.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK FOR MULTIPLE FUEL INJECTOR DTCS

Were there multiple Fuel Injector DTCS set in the PCM?

Yes

- Go To [10](#)

No

- Replace the Fuel Injector 6 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK FOR ONE FUEL INJECTOR CAUSING MULTIPLE FUEL INJECTOR FAULTS

1. Reconnect all harness connectors.
2. Turn the ignition on.
3. With the scan tool, erase all PCM DTCs.
4. Disconnect the Fuel Injector 6 harness connector.
5. With the scan tool, read the PCM DTCs.

NOTE: The continued setting of multiple DTCs indicates that the disconnected injector is not the cause of these faults.

NOTE: If multiple DTCs did not reset after disconnecting a single injector, replace the injector that was disconnected. In this case the lack of multiple DTCs setting indicates that the disconnected injector is the cause of these faults.

Choose the correct result below.

The PCM set Multiple Injector DTCs

- Reconnect the disconnected Injector harness connector and repeat test by disconnecting another injector until multiple DTCs are not set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

The PCM set only a DTC for the disconnected Injector

- Replace the Fuel Injector that was disconnected in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0278-00-CYLINDER 6 CONTRIBUTION/BALANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) utilizes Fuel quantity Balancing Control (FBC) to monitor rationality failures. The task of FBC is to minimize speed variations in idle operation and in the lower engine speed range. The FBC evaluates oscillations of the engine speed signal in order to determine cylinder specific fuel quantity correction. The diagnostic continuously monitors these correction quantities for each individual cylinder.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running for at least five seconds.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the positive or negative Fuel quantity Balancing Control (FBC) for this Injector is within a calibrated range for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CORRECTION CODE NOT ENTERED CORRECTLY INTO PCM
FUEL INJECTOR
FUEL SYSTEM FAILURE
INTAKE SYSTEM LEAK OR RESTRICTION
ENGINE MECHANICAL FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK THE FUEL INJECTOR CORRECTION CODES IN THE PCM

1. Turn the ignition off.
2. Locate and record the correction code for the Fuel Injector (related to this DTC). The Injector correction codes areas located on top of the Injectors.
3. Turn the ignition on, engine not running.
4. With the scan tool, read the Fuel Injector correction code stored in the PCM.
5. Compare Fuel Injector correction code with the code programmed in the scan tool.

Is the Fuel Injector calibrated correctly?

Yes

- Go To [2](#)

No

- Program the Fuel Injector correction code (related to this DTC) with the scan tool into the PCM. The Fuel Injector correction codes are located on top of the Injectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE INTAKE SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the entire intake system for a leak or restriction.

Were any INTAKE SYSTEM problems found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were any FUEL DELIVERY problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE ENGINE MECHANICAL SYSTEM

1. Perform the CHECKING THE ENGINE MECHANICAL SYSTEM diagnostic procedure. Refer to **CHECKING THE ENGINE MECHANICAL SYSTEMS** .

Were any ENGINE MECHANICAL problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. INSTALL A NEW FUEL INJECTOR AND CHECK FOR DTC TO RETURN

1. Turn the ignition off.
2. Replace the Fuel Injector (related to this DTC) in accordance with the Service Information. Program the correction code for this injector into the Powertrain Control Module.

NOTE: The new Fuel Injector correction code is located on top of the injector.

3. Turn the ignition on.
4. With the scan tool, Erase DTCs.
5. Start the engine. Allow the engine to reach normal operating
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

Did the DTC return as active?

Yes

- Go To [7](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0299-00-TURBOCHARGER UNDERBOOST CONDITION

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

GENERAL OPERATION: The Powertrain Control Module (PCM) monitors the intake air flow, and controls the variable geometry turbocharger (VGT) position to obtain the correct amount of fresh air and exhaust gas recirculation (EGR) for the injected amount of fuel. The PCM compares the actual air flow (calculated using multiple sensors in the intake air system - Mass Air Flow, Boost Pressure, and Temperature sensors) versus the desired air flow. If the difference between these two is greater than a calibrated amount, for a calibrated period of time, the under boost, or over boost diagnostic trouble code (DTC) will be set. Anything that affect air flow (exhaust or intake) through the engine can cause an under boost or over boost condition. This can include leaks or blockages in the intake air system plumbing, or the exhaust system. These system should be carefully inspected before condemning any component.

The main component used to manage boost is the Variable Gate Turbocharger (VGT) Assembly. The base VGT boost pressure is managed through the position of the turbine vanes. When the PCM is trying to build boost pressure (to protect from an under boost condition), it closes down the effective area of the VGT turbine vanes to increase VGT speeds. When the PCM is trying to reduce boost pressure (to protect from an over boost condition), it opens up the effective area of the VGT turbine vanes reducing the VGT speed.

Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM balances operates the Turbocharger system in two separate modes to balance between efficiency and performance. Based on atmospheric conditions and operating needs the Turbocharger system can operate in either Rapid Heat-Up or Standard Heat-Up mode. Regardless of which mode the system is operating in the under boost and over boost diagnostics are the same. However, a different DTC will set a based on which mode of operation the system was in when a fault occurs.

- The PCM sets the P2D2F-00 DTC when there is an under boost occurrence during the Rapid Heat-Up mode.
- The PCM sets the P0299-00 DTC when there is an under boost occurrence during the Standard Heat-Up mode.
- Because the PCM switches between Rapid Heat-Up and Standard Heat-Up mode, both DTCs may be present when under boost is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Powertrain Control Module (PCM) is attempting to govern Turbocharger boost pressure.

SET CONDITION

- The Boost Pressure Sensor indicates the actual Turbocharger boost is less than the Powertrain Control Module (PCM) set point for engine boost for a calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
RESTRICTED AIR FILTER
AIR CLEANER BOX DAMAGED, OUT-OF-POSITION, AND/OR NOT SEALED PROPERLY
INTAKE AIR SYSTEM LEAKS OR RESTRICTIONS PRESENT SUCH AS ICE OR WATER
EXHAUST SYSTEM LEAKS OR RESTRICTIONS
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
TURBO ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
TURBO ACTUATOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
BOOST PRESSURE SENSOR
TURBOCHARGER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, using the scan tool, run and save a Vehicle Scan Report, Freeze frame Data, and any other recorded information available.
3. With the scan tool, erase all DTCs.
4. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
7. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel System, EGR, CAC, Intake Air, or Turbocharger-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE AIR FILTER AND THE AIR CLEANER BODY FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Check the Air Cleaner Body for cracks, out of position, improperly secured lid, or other damage.
3. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE INTAKE AIR SYSTEM FOR ICE BUILD UP OR WATER RESIDUE

NOTE: Ice build up or water residue in the Intake Air System can cause this DTC to set.

NOTE: The Vehicle Owner should be advised to use a Winter Front cover during cold ambient conditions.

1. Inspect all hoses/tubes and connections within the Intake Air System and Turbocharger for ice build up or water residue. Pay particular attention to the Charge Air Cooler.

Was there any ice build up or water residue in the Intake Air System or Charge Air System?

Yes

- Thaw out any ice, remove any water residue. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
- If the DTC still returns as Active or Pending: Go To [5](#)
- If the DTC does not return: Removing the ice and water repaired the condition. Advise the Vehicle Owner to use a Cold Weather Front End Cover during cold ambient temperatures.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. VISUALLY INSPECT THE INTAKE AIR SYSTEM, CHARGE AIR COOLER AND EGR AIRFLOW CONTROL VALVE FOR LEAKS OR RESTRICTIONS

NOTE: Damaged, restricted, or poorly connected intake air and Turbocharger related tubes can cause this DTC to set.

1. Turn the ignition off.
2. Visually inspect all air intake, crankcase vent and Turbocharger related hoses/tubes and connections for poor fitting, leaks, or restrictions.
3. Visually inspect the Charge Air Cooler hoses/tubes and connections for poor fitting, leaks, or restrictions.

NOTE: The PCM uses the EGR Airflow Control Valve to meter the amount of fresh air entering the Intake Manifold. This metered fresh air controls the amount of surface pressure on the EGR Valve. The PCM uses this method to enhance control over exhaust gas recirculation. The EGR Airflow Control Valve is sometimes called: 'Throttle Valve Actuator (TVA)'.

4. Visually inspect the EGR Air Flow Control Valve to confirm that the valve is not stuck in the closed position.

Were any problems found in the Intake Air System, Charge Air System, or EGR Airflow Control Valve system?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. PERFORM THE INTAKE AIR SYSTEM PRESSURE TEST

1. Perform the Intake Air System Leak Detection procedure found in: Engine/Diagnosis and Testing. Refer to [**INTAKE AIR SYSTEM LEAK DETECTION**](#) .

Were any Intake Air System leaks found using the Smart Pressure smoke machine?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECK THE BOOST PRESSURE ACTUATOR CONNECTOR AND TERMINALS

1. Check the Boost Pressure Actuator harness connector for proper connection at the Boost Pressure Actuator.
2. Verify that the connector is completely plugged in and locked prior to disconnecting.
3. Disconnect the Boost Pressure Actuator harness connector and check for pushed out, corroded or spread terminals.

Were any issues found with the connector or terminals?

Yes

- Repair the terminals or properly connect and lock the Boost Pressure Actuator harness connector.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. CHECK THE FUSED ASD RELAY (F343) OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE:

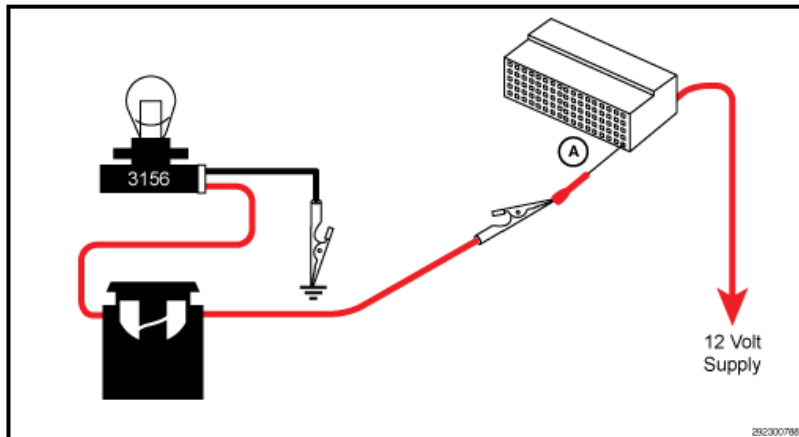
Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES**](#) .**

1. Disconnect the Boost Pressure Actuator harness connector.

CAUTION: Do not load test any circuits with components still connected to the circuit.

2. Turn the ignition on.

3. Load test the Fused ASD Relay (F343) Output circuit at the Boost Pressure Actuator harness connector. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the ASD Relay (F343) Output circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

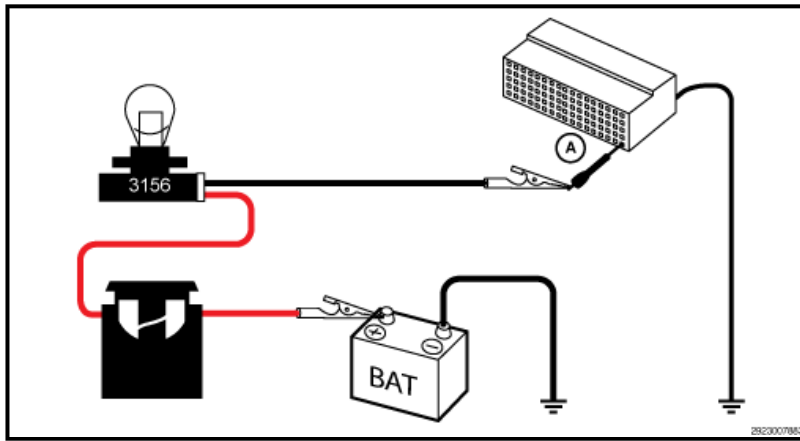
9. CHECK THE (Z908) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

1. Turn the ignition off.

CAUTION: Do not load test any circuits with components still connected to the circuit.

2. Load test the (Z908) Ground circuit at the Boost Pressure Actuator harness connector (A). **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK THE BOOST PRESSURE ACTUATOR (K137) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: The PCM uses Pulse-Width Modulation (PWM) to control the position of the Turbo Actuator pushrod. The PCM sends these commands on the K137 circuit. This makes it a 'control' circuit. In the wiring diagrams, it is called a 'signal' circuit.

1. Turn the ignition off.
2. Disconnect the Boost Pressure Actuator harness connector.
3. Disconnect the PCM harness connector.
4. Check the resistance of the Boost Pressure Actuator (K137) Control circuit between the Boost Pressure Actuator harness connector and the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the (K137) Boost Pressure Actuator Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P02E0-00-DIESEL INTAKE AIR FLOW CONTROL CIRCUIT/OPEN

For a complete THROTTLE CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects an open or high resistance on the Throttle Valve Actuator (+) or (-) circuits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
THROTTLE VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE AIR CLEANER AND THROTTLE VALVE FOR FOREIGN DEBRIS OR OBSTRUCTIONS

1. Visually inspect the Air Cleaner and Throttle Valve for any signs of foreign debris or obstructions.

Are any issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE ACTUATOR (K315) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the Throttle Valve Actuator (K315) circuit between the Throttle Valve Actuator harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Throttle Valve Actuator (K315) circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE THROTTLE VALVE ACTUATOR (K314) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Throttle Valve Actuator (K314) circuit between the Throttle Valve Actuator harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Throttle Valve Actuator (K314) circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Install a new Throttle Valve Actuator in accordance with the Service Information.
2. Reconnect the Throttle Valve Actuator harness connector.
3. Reconnect the PCM C2 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine and test drive the vehicle until the engine reaches operating temperature.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P02E1-00-DIESEL INTAKE AIR FLOW CONTROL PERFORMANCE

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the Throttle Valve Actuator circuit (upper limit of) maximum or (lower limit of) minimum deviates from a calibrated threshold for 3.0 seconds. This is a one Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any EGR, Intake Air Flow Open, Low, or High DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Replace the Throttle Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P02E7-00-DIESEL INTAKE AIR FLOW POSITION SENSOR CIRCUIT PERFORMANCE

For a complete THROTTLE CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow

Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- A comparison of the Throttle Valve desired (position) and actual (position) is called the Offset. For this DTC, the PCM monitors the difference between the offset during the first drive cycle (a long-term calibration) and the first learned offset (this drive cycle). This DTC will set if the closed position or open position differences are greater than or less than a calibrated threshold. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, EGR Valve, or Intake Air flow Position Sensor circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Replace the Throttle Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P02E8-00-DIESEL INTAKE AIR FLOW POSITION SENSOR CIRCUIT LOW

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Throttle Position Signal circuit is below calibrated threshold for 0.2 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
THROTTLE POSITION SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
THROTTLE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE THROTTLE POSITION (K22) SIGNAL CIRCUIT FOR A SHORT TO GROUND

NOTE: There is an in-line harness connector that will allow easier access to these circuits for testing.

1. Turn the ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and the Throttle Position (K22) Signal circuit at the Throttle Valve Actuator harness connector.

Is there continuity between ground and the Throttle Position (K22) Signal circuit?

Yes

- Repair the Throttle Position (K22) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR THE THROTTLE POSITION (K22) SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR GROUND CIRCUIT

1. Check for continuity between the Throttle Position Signal (K22) circuit and the (K922) Sensor Ground circuit at the Throttle Valve Actuator harness connector.

Is there continuity between the Throttle Position S(K22) ignal circuit and the (K922) Sensor Ground circuit?

Yes

- Repair the short between the (K22) Throttle Position Signal circuit and the (K922) Sensor Ground circuit
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

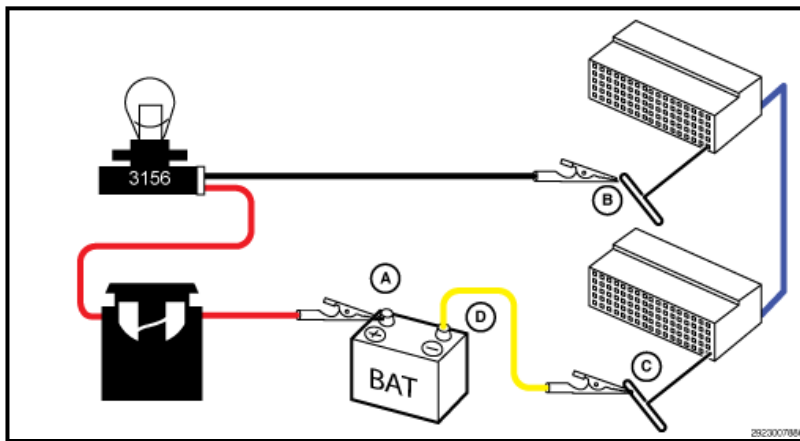
- Go To [5](#)

5. ISOLATE AND LOAD TEST THE THROTTLE POSITION (K22) SIGNAL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Disconnect the Air Flow Control Valve harness connector.
2. Disconnect the PCM C2 harness connector.
3. Load test the Throttle Position (K22) Signal circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

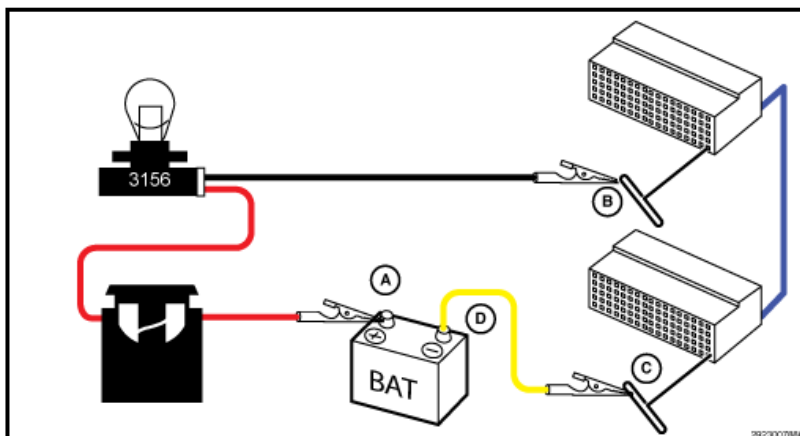
- Repair the Throttle Position (K22) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. ISOLATE AND LOAD TEST THE (K922) SENSOR GROUND CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (K922) Sensor Ground circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the

bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [7](#)

No

- Repair the (K922) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE ABILITY OF THE PCM TO READ THE THROTTLE POSITION SIGNAL

1. Reconnect the Throttle Valve Actuator harness connector.
2. Reconnect the PCM C2 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the Throttle Valve Actuator harness connector.
7. Connect a jumper between the Throttle Position (K22) Signal circuit and the (K313) 5-Volt Supply circuit at the TV Actuator harness connector.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

Does the scan tool display DTC P02E9-00?

Yes

- Replace the Throttle Valve Actuator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P02E9-00-DIESEL INTAKE AIR FLOW POSITION SENSOR CIRCUIT HIGH

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Throttle Position Signal circuit is above a calibrated threshold for 0.2 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
THROTTLE VALVE SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE THROTTLE POSITION (K22) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

NOTE: There is an in-line harness connector that will allow easier access to these circuits for testing.

1. Turn the ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Turn the ignition on.
4. Connect one voltmeter probe to ground and measure the voltage on the Throttle Position (K22) Signal circuit at the Throttle Valve Actuator harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Throttle Position (K22) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the TV Actuator harness connector.
4. Turn the ignition on.
5. With the scan tool, erase PCM DTCs.
6. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
7. Start the engine and let it run for two minutes.
8. With the scan tool, read PCM DTCs.

Does the scan tool display P02E9-00-DIESEL INTAKE AIR FLOW POSITION SENSOR CIRCUIT HIGH?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P02EC-00-DIESEL INTAKE AIR FLOW CONTROL SYSTEM - HIGH AIR FLOW DETECTED

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- DPF Regeneration is active.

SET CONDITION

- The PCM detects the Intake Air Flow deviation between the desired and the actual is above a calibrated threshold for 5.0 seconds. This is a one Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR ACTUATOR (+) CIRCUIT SHORTED TO VOLTAGE
THROTTLE VALVE MOTOR ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
THROTTLE VALVE MOTOR ACTUATOR (+) CIRCUIT SHORTED TO GROUND
THROTTLE VALVE MOTOR ACTUATOR (-) CIRCUIT SHORTED TO GROUND
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE AIR CLEANER AND THROTTLE VALVE FOR FOREIGN DEBRIS OR OBSTRUCTIONS

1. Visually inspect the Air Cleaner and Throttle Valve for any signs of foreign debris or obstructions.

Are any issues found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**3**](#)

3. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Turn the ignition on.
4. Connect one voltmeter probe to ground and measure the voltage on the Throttle Valve Motor (K314) Actuator (+) circuit at the Throttle Valve Actuator harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE THROTTLE VALVE MOTOR (K315) ACTUATOR (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Connect one voltmeter probe to ground and measure the voltage on the Throttle Valve Motor (K315) Actuator (-) circuit at the Throttle Valve Actuator harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the Throttle Valve Motor (K315) Actuator (-) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the Throttle Valve Motor (K314) Actuator (+) circuit at the Throttle Valve Actuator harness connector.

Is there continuity between ground and the Throttle Valve Motor (K314) Actuator (+) circuit?

Yes

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

6. CHECK THE THROTTLE VALVE MOTOR (K315) ACTUATOR (-) CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the Throttle Valve Motor (K315) Actuator (-) circuit at the Throttle Valve Actuator harness connector.

Is there continuity between ground and the Throttle Valve Motor (K315) Actuator (-) circuit?

Yes

- Repair the Throttle Valve Motor (K315) Actuator (-) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

7. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Install a new Throttle Valve Actuator in accordance with the Service Information.
2. Reconnect the TV Actuator harness connector.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Start the engine and let it run for two minutes.
7. With the scan tool, read PCM DTCs.

Does the scan tool display P02EC-00-DIESEL INTAKE AIR FLOW CONTROL SYSTEM - HIGH AIR FLOW DETECTED DTC?

Yes

- Go To [8](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P02ED-00-DIESEL INTAKE AIR FLOW CONTROL SYSTEM - LOW AIR FLOW DETECTED

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Intake Air Flow deviation between the desired and the actual is below a calibrated threshold for 5.0 seconds. This is a one Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR ACTUATOR (+) CIRCUIT SHORTED TO GROUND
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE AIR CLEANER AND THROTTLE VALVE FOR FOREIGN DEBRIS OR OBSTRUCTIONS

1. Visually inspect the Air Cleaner and Throttle Valve for any signs of foreign debris or obstructions.

Are any issues found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and the Throttle Valve Motor (K314) Actuator (+) circuit at the Throttle Valve Actuator harness connector.

Is there continuity between ground and the Throttle Valve Motor (K314) Actuator (+) circuit?

Yes

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the TV Actuator harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
8. Start the engine and let it run for two minutes.
9. With the scan tool, read PCM DTCs.

Does the scan tool display P02ED-00-DIESEL INTAKE AIR FLOW CONTROL SYSTEM - LOW AIR FLOW DETECTED DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P02FA-00-DIESEL INTAKE AIR FLOW POSITION SENSOR MINIMUM/MAXIMUM STOP PERFORMANCE

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- A comparison of the Throttle Valve desired (position) and actual (position) is called the Offset. For this DTC, the PCM monitors the difference between the offset during the first drive cycle (a long-term calibration) and the first learned offset (this drive cycle). This DTC will set if the closed position or open position differences are greater than or less than a calibrated threshold. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, EGR Valve, or Intake Air flow Position Sensor circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. INSTALL A NEW THROTTLE VALVE ACTUATOR AND RETEST FOR DTC

1. Replace the Throttle Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0300-00-MULTIPLE CYLINDER MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any active component or circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: **Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.**

1. Inspect the engine for any of the following conditions:
 - Worn serpentine belt
 - Misalignment or binding water pump, P/S pump or A/C compressor pulleys
 - Improper CKP, CMP, or MAP Sensor mounting.
 - Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
 - Corroded PCM power or ground circuits.
 - Vacuum leaks.
 - Restriction in the air induction or exhaust system.
 - Internal engine component malfunction.
 - Insufficient fuel
 - Low quality fuel

- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0301-00-CYLINDER 1 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any active component or circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:

- Worn serpentine belt
- Misalignment or binding water pump, P/S pump or A/C compressor pulleys
- Improper CKP, CMP, or MAP Sensor mounting.
- Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
- Corroded PCM power or ground circuits.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0302-00-CYLINDER 2 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

- With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
- For future reference, run and save a vehicle Scan Report and all related recorded data.
- With the scan tool, erase all DTCS.
- Turn the ignition off for a minimum of 75.0 seconds.
- Turn the ignition on.
- Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
- With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any active component or circuit DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:

- Worn serpentine belt
- Misalignment or binding water pump, P/S pump or A/C compressor pulleys
- Improper CKP, CMP, or MAP Sensor mounting.
- Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
- Corroded PCM power or ground circuits.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0303-00-CYLINDER 3 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

- With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
- For future reference, run and save a vehicle Scan Report and all related recorded data.
- With the scan tool, erase all DTCS.
- Turn the ignition off for a minimum of 75.0 seconds.
- Turn the ignition on.
- Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
- With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

- Refer to the recorded DTCS.

Are there any active component or circuit DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:

- Worn serpentine belt
- Misalignment or binding water pump, P/S pump or A/C compressor pulleys
- Improper CKP, CMP, or MAP Sensor mounting.
- Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
- Corroded PCM power or ground circuits.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0304-00-CYLINDER 4 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any active component or circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector

control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:

- Worn serpentine belt
- Misalignment or binding water pump, P/S pump or A/C compressor pulleys
- Improper CKP, CMP, or MAP Sensor mounting.
- Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
- Corroded PCM power or ground circuits.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0305-00-CYLINDER 5 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS

Possible Causes
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any active component or circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:
 - Worn serpentine belt

- Misalignment or binding water pump, P/S pump or A/C compressor pulleys
- Improper CKP, CMP, or MAP Sensor mounting.
- Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
- Corroded PCM power or ground circuits.
- Vacuum leaks.
- Restriction in the air induction or exhaust system.
- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0306-00-CYLINDER 6 MISFIRE

THEORY OF OPERATION

The misfire detection monitor software strategy in the Powertrain Control Module (PCM) is designed to detect an engine misfire. The PCM uses the Crankshaft (CKP) and Camshaft (CMP) sensors to determine when an engine misfire event is occurring and determine individual misfire events by monitoring the crankshaft rotational speed. A misfire is nothing more than a lack of combustion, which can be caused by poor fuel quality or metering, low compression, or unmetered air entering the engine. On engines equipped with Exhaust Gas Recirculation (EGR), another possible cause is unwanted EGR flow. In the case of multiple cylinders misfiring or the PCM not determining the specific cylinder misfiring, P0300 Multiple Cylinder Misfire will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the engine is running and the adaptive numerator has been successfully updated.

SET CONDITION

- If the Powertrain Control Module (PCM) detects that the variation in crankshaft speed between each cylinder exceeds a calibrated value, based on engine RPM and load, a fault is set.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
ECT SENSOR, WIRING, OR CONNECTORS
O2 SENSOR, WIRING, OR CONNECTORS
ENGINE MECHANICAL SYSTEM
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any active component or circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. DIAGNOSTIC INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause this DTC to set. When a misfire is detected, the PCM will shut down the injector control circuit for the misfiring cylinder. Misfire may occur and may not be caused by component failure. Any of the following conditions can cause a misfire.

1. Inspect the engine for any of the following conditions:
 - Worn serpentine belt
 - Misalignment or binding water pump, P/S pump or A/C compressor pulleys
 - Improper CKP, CMP, or MAP Sensor mounting.
 - Poor connector/terminal to component connection for CKP sensor, CMP sensor, MAP sensor, throttle body, fuel injector, etc.
 - Corroded PCM power or ground circuits.
 - Vacuum leaks.
 - Restriction in the air induction or exhaust system.

- Internal engine component malfunction.
- Insufficient fuel
- Low quality fuel
- Manual transmission bog
- Towing overload

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECKING THE FUEL DELIVERY SYSTEM

1. Perform the diagnostic procedures for FUEL PRESSURE LEAK DOWN and FUEL DELIVERY SYSTEM OUTPUT - FLOW TEST.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECKING THE OXYGEN SENSOR OPERATION

1. Perform the diagnostic procedure for CHECKING THE OXYGEN SENSOR OPERATION.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **7**

7. CHECKING THE ENGINE MECHANICAL SYSTEM

1. Perform the diagnostic procedure for CHECKING THE ENGINE MECHANICAL SYSTEM.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **8**

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0335-00-CRANKSHAFT POSITION SENSOR CIRCUIT

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information.

THEORY OF OPERATION

The Crankshaft Position (CKP) Sensor is a hall effect type sensor. The sensor produces a 5 Volt digital signal (square wave). The PCM provides a 5-Volt supply, 5-Volt sensor signal and ground to the CKP Sensor. The sensor is positioned opposite a Crankshaft Reluctor Wheel at the rear of the crankshaft. The Crankshaft Reluctor Wheel contains internal magnetic strips (electric teeth) that act on the hall-effect switch causing the digital switching of the sensor signal from high (5 Volts) to low (0 Volts).

WHEN MONITORED

- This diagnostic runs continuously with the engine cranking and with the engine running.

SET CONDITION

- There are two conditions in which this DTC can set:
 - **During cranking:** The CKP Sensor signal is unable to be locked for more than approximately 2.5 seconds after the CMP Sensor signal is locked.
 - **Engine running:** The PCM loses the CKP position (unlocks) and fails to re-lock within approximately 0.15 seconds.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO THE CKP SENSOR GROUND CIRCUIT
5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
CKP SIGNAL CIRCUIT SHORTED TO VOLTAGE
CKP SIGNAL CIRCUIT SHORTED TO GROUND
CKP SIGNAL CIRCUIT SHORTED TO THE CKP SENSOR GROUND CIRCUIT
CKP SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CKP SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
CRANKSHAFT POSITION SENSOR MOUNTED INCORRECTLY OR MOUNTING SURFACE DAMAGED
TARGET WHEEL/PULSE RING BENT / BROKEN / MISSING TEETH / EXCESSIVE RUNOUT
CRANKSHAFT POSITION SENSOR (CKP)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE CKP SENSOR (K24) SIGNAL CIRCUIT

1. Turn the ignition off.
2. Disconnect the Crankshaft Position Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the CKP Sensor (K24)Signal circuit at the CKP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Go To [4](#)

Voltage is between 4.8 and 5.2 volts

- Go To [5](#)

Voltage is below 4.8 volts

- Go To [11](#)

4. CHECK THE CKP SENSOR (K24) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Remove the ASD Relay.
4. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
5. Turn the ignition on.
6. Measure the voltage of the CKP Sensor (K24) Signal circuit at the CKP Sensor harness connector.

Is there any voltage present?

Yes

- Repair the (K24) Crankshaft Position Sensor Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [14](#)

5. CHECK THE (K853) 5-VOLT SUPPLY CIRCUIT

1. Measure the voltage of the (K853) 5-Volt Supply circuit at the CKP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Repair the (K853) 5-Volt Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

Voltage is between 4.8 and 5.2 volts

- Go To [6](#)

Voltage is below 4.8 volts

- Go To [8](#)

6. CHECK THE (K925) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the (K925) Sensor Ground circuit between the CKP Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (K925) CKP Sensor Signal circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK FOR A DAMAGED CRANKSHAFT POSITION SENSOR OR CRANKSHAFT

1. Turn the ignition off.
2. Remove the CKP Sensor.
3. Inspect the CKP Sensor for conditions such as loose mounting screws, damage, or cracks.
4. Inspect the Crankshaft magnetic tone wheel for conditions such as damage, or debris.

Is there any evidence of these conditions?

Yes

- Go To [14](#)

No

- Replace the Crankshaft Position Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE (K853) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the (K853) Sensor 5-Volt Supply circuit between the PCM C2 harness connector and the CKP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the (K853) 5-Volt Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK THE (K853) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the (K853) 5-Volt Supply circuit at the CKP Sensor harness connector.

Is there continuity between ground and the (K853) 5-Volt Supply circuit?

Yes

- Repair the (K853) 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK FOR THE (K853) 5-VOLT SUPPLY CIRCUIT SHORTED TO THE CKP (K925) SENSOR GROUND CIRCUIT

1. Check for continuity at the CKP Sensor harness connector.

Is there Check for continuity?

Yes

- Repair the (K853) 5-Volt Supply circuit for a short to the CKP Sensor (K925) Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [14](#)

11. CHECK THE CKP SENSOR SIGNAL (K24) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C2 harness connector.
2. Measure the resistance of the CKP Sensor (K24) Signal circuit between the PCM C2 harness connector and the CKP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [12](#)

No

- Repair the (K24) CKP Sensor Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

12. CHECK THE CKP SENSOR (K24) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the CKP Sensor (K24) Signal circuit at the CKP Sensor harness connector.

Is there continuity between ground and the CKP Sensor (K24) Signal circuit?

Yes

- Repair the (K24) CKP Sensor Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [13](#)

13. CHECK FOR THE CKP SENSOR (K24) SIGNAL CIRCUIT SHORTED TO THE (K925) SENSOR GROUND CIRCUIT

1. Check for continuity between the CKP Sensor (K24) Signal circuit and the (K925) Sensor Ground circuit at the CKP Sensor harness connector.

Is there continuity between the CKP Sensor (K24) Signal circuit and the (K925) Sensor Ground circuit?

Yes

- Go To [14](#)

No

- Repair the CKP Sensor (K24) Signal circuit for a short to the (K925) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

14. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0336-00-CRANKSHAFT POSITION SENSOR PERFORMANCE

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Crankshaft Position (CKP) Sensor is a hall effect type sensor. The sensor produces a 5 Volt digital signal (square wave). The PCM provides a 5-Volt supply, 5-Volt sensor signal and ground to the CKP Sensor. The sensor is positioned opposite a Crankshaft Reluctor Wheel at the rear of the crankshaft. The Crankshaft Reluctor Wheel contains internal magnetic strips (electric teeth) that act on the hall-effect switch causing the digital switching of the sensor signal from high (5 Volts) to low (0 Volts).

WHEN MONITORED

This diagnostic runs

- With the engine cranking or running.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a signal from the Crankshaft Position Sensor (CKP) when the Camshaft Position Sensor (CMP) indicates engine RPM.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CKP SENSOR 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
CKP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE CKP SENSOR GROUND CIRCUIT
CKP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CKP SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CKP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CKP SENSOR SIGNAL CIRCUIT SHORTED TO THE CKP SENSOR GROUND CIRCUIT
CKP SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
CRANKSHAFT RELUCTOR WHEEL
CRANKSHAFT POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [5](#)

No

- Go To [3](#)

3. WIRE HARNESS/CKP SENSOR INSPECTION

1. Turn the ignition off.
2. Verify that the CKP Sensor harness connector is fully seated and the primary lock is engaged at the sensor before disconnecting.
3. Start the engine and wiggle test the wiring harness and connectors in attempt to duplicate the problem.
4. Turn the ignition off.
5. Disconnect the harness connectors at the PCM and Crank Sensor and inspect for wire chaffing or rub conditions, terminals pushed out on the wiring connector, bent terminals at the PCM and Crank Sensor, water in the connector cavities, presence of corrosion on the terminals of the connectors or components.
6. Visually inspect the mounting area of Crank Sensor for debris/damage or a loose sensor.

Were any problems found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE VEHICLES REPAIR HISTORY

1. Check the history of the vehicle for previous Crank Sensor related DTCS within the past 30 days. Verify if the Crank Sensor was replaced during the visit.

Did the repair history show that the vehicle was in dealership for a crank sensor fault within the past 30 days?

Yes, and the Crank Sensor was replaced on previous visit

- Wiggle test the wiring harness and connectors again and try to duplicate the issue. If not able to duplicate, remove the Crank Sensor, and visually inspect the sensor mounting location for damage, foreign material.
- Inspect the target wheel for any signs of damage by placing a bore scope into the CKP Sensor bore and manually rotate the engine slowly using a wrench on the crank damper bolt. For stamped steel targets, pay close attention to the light reflection of the bore scope light on each tooth. If a tooth is bent, the reflection (bright spot) will move in relation to the reflection of the other teeth that are not bent. The light reflection will remain in the same location on each tooth if none of the teeth are bent. For powder metal targets, look for any tooth that is dull or does not shine as compared to the other teeth. The rough surface that remains from a tooth that has broken off appears to be dull/non-reflective.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

Yes, and the Crank Sensor was not replaced on the last visit

- Replace the Crank Sensor in accordance with the Service Information. With the scan tool, perform the Cam/Crank Relearn Procedure. The Cam/Crank Relearn Procedure must be performed every time there has been a repair/replacement made to a CMP Sensor and/or CKP Sensor, flywheel, valvetrain, timing chain or gears. Failure to do so can cause a misfire fault to set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Test complete. Reconnect the harness connectors and erase the DTC. The most likely cause was a poor connection at one of the harness connectors.

5. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Reference DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [**6**](#)

6. CHECK THE (K853) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the CKP Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the (K853) 5-Volt Supply circuit at the CKP Sensor harness connector.

Is the voltage between 4.8 and 5.2 volts?

Yes

- Go To [**7**](#)

No, voltage is below 4.8 volts:

- Repair the 5-Volt Supply circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No, voltage is above 5.2 volts:

- Repair the 5-Volt Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE CKP (K24) SIGNAL CIRCUIT VOLTAGE

1. Measure the voltage on the CKP (K24) Signal circuit at the CKP Sensor harness connector.

Is the voltage between 4.8 and 5.2 volts?

Yes

- Go To [8](#)

No, voltage is below 5.2 volts:

- Go To [10](#)

No, voltage is above 5.2 volts:

- Repair the 5-Volt Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE (K925) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the (K925) Sensor Ground circuit between the CKP Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the (K925) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. VISUALLY INSPECT THE TARGET WHEEL/PULSE RING FOR DAMAGE OR EXCESSIVE RUNOUT

1. Disconnect the battery ground cable.
2. Remove the CKP Sensor.
3. Visually inspect the sensor mounting location for damage, foreign material.
4. Rotate the engine and if possible inspect the Target Wheel for any signs of damage.
5. Inspect the target wheel for any signs of damage by placing a bore scope into the CKP Sensor bore and manually rotate the engine slowly using a wrench on the crank damper bolt. For stamped steel targets, pay close attention to the light reflection of the bore scope light on each tooth. If a tooth is bent, the reflection (bright spot) will move in relation to the reflection of the other teeth that are not bent. The light reflection will remain in the same location on each tooth if none of the teeth are bent. For powder metal targets, look for any tooth that is dull or does not shine as compared to the

other teeth. The rough surface that remains from a tooth that has broken off appears to be dull/non-reflective.

Were any problems found?

Yes

- Repair Issues in mounting location, or repair or replace the Target Wheel / Pulse Ring as necessary. With the scan tool, perform the Cam/Crank Relearn Procedure. The Cam/Crank Relearn Procedure must be performed every time there has been a repair/replacement made to a CMP Sensor and/or CKP Sensor, flywheel, valvetrain, timing chain or gears. Failure to do so can cause a misfire fault to set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the Crank Position Sensor in accordance with the Service Information. With the scan tool, perform the Cam/Crank Relearn Procedure. The Cam/Crank Relearn Procedure must be performed every time there has been a repair/replacement made to a CMP Sensor and/or CKP Sensor, flywheel, valvetrain, timing chain or gears. Failure to do so can cause a misfire fault to set.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

10. CHECK THE CKP (K24) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Check for continuity between ground and the CKP (K24) Signal circuit at the CKP Sensor harness connector.

Is there continuity between ground and the CKP (K24) Signal circuit?

Yes

- Repair the CKP (K24) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [11](#)

11. CHECK THE CKP (K24) SIGNAL CIRCUIT FOR A SHORT TO THE (K925) SENSOR GROUND

1. Check for continuity between the CKP (K24) Signal circuit and the (K925) Sensor Ground circuit at the CKP Sensor harness connector.

Is there continuity between the CKP (K24) Signal circuit and the (K925) Sensor Ground circuit?

Yes

- Repair the short between the CKP (K24) Signal circuit and the (K925) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [12](#)

12. CHECK THE CKP (K24) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the CKP (K24) Signal circuit between the CKP Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [13](#)

No

- Repair the CKP (K24) Signal circuit for an open circuit or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

13. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0340-00-CAMSHAFT POSITION SENSOR CIRCUIT - BANK 1 SENSOR 1

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Camshaft Position (CMP) Sensor is a hall effect type sensor. The sensor produces a 5 Volt digital signal (square wave). The PCM provides a 5 Volt supply, 5 Volt sensor signal and ground to the CMP Sensor. The sensor is positioned near the right front of the Timing Cover. As the camshaft rotates, the eccentric passes closely to the CMP sensor triggering the hall-effect switch causing the digital switching of the sensor signal from high (5 Volts) to low (0 Volts).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While engine is cranking
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) receive a disturbed signal from the Camshaft Position Sensor when the Crankshaft Position Sensor indicates engine RPM.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CMP 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
CMP SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CMP SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO THE CMP SENSOR GROUND CIRCUIT
CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE CMP SENSOR GROUND CIRCUIT
CAMSHAFT POSITION SENSOR (CMP)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE CAMSHAFT POSITION SENSOR (K44) SIGNAL CIRCUIT

1. Turn the ignition off.
2. Disconnect the CMP Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the CMP Sensor (K44) Signal circuit at the CMP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Go To [4](#)

Voltage is between 4.8 and 5.2 volts

- Go To [5](#)

Voltage is below 4.8 volts

- Go To [11](#)

4. CHECK THE CAMSHAFT POSITION (K44) SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.

2. Disconnect the PCM C2 harness connector.
3. Remove the ASD Relay.
4. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
5. Turn the ignition on.
6. Measure the voltage of the CMP Position (K44) Sensor Signal circuit at the CMP Sensor harness connector.

Is the voltage below 1.0 volt?

Yes

- Go To [14](#)

No

- Repair the Camshaft Position (K44) Sensor Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT

1. Measure the voltage of the (K844) 5-Volt Supply circuit at the CMP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Repair the (K844) 5-Volt Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

Voltage is between 4.8 and 5.2 volts

- Go To [6](#)

Voltage is below 4.8 volts

- Go To [8](#)

6. CHECK THE (K944) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the (K944) Sensor Ground circuit between the CMP Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (K944) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK FOR A DAMAGED CAMSHAFT POSITION SENSOR OR CAMSHAFT

1. Turn the ignition off.

2. Remove the CMP Sensor.
3. Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks.
4. Inspect the Camshaft Tone Wheel for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

Yes

- Replace the damaged Camshaft Position Sensor or Camshaft Tone Wheel in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [14](#)

8. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the (K844) 5-Volt Supply circuit between the PCM C2 harness connector and the CMP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the (K844) 5-Volt Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

9. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the (K844) 5-Volt Supply circuit at the CMP Sensor harness connector.

Is there continuity between ground and the (K844) 5-Volt Supply circuit?

Yes

- Repair the (K844) 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [10](#)

10. CHECK FOR THE (K844) 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) SENSOR GROUND CIRCUIT

1. Check for continuity between the (K844) 5-Volt Supply circuit and the (K944) Sensor Ground circuit at the CMP Sensor harness connector.

Is there continuity between the (K844) 5-Volt Supply circuit and the (K944) Sensor Ground circuit?

Yes

- Repair the (K844) 5-Volt Supply circuit for a short to the (K944) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [14](#)

11. CHECK THE CAMSHAFT POSITION (K44) SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the CMP Sensor (K44) Signal circuit between the PCM C2 harness connector and the CMP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [12](#)

No

- Repair the CMP Sensor (K44) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

12. CHECK THE CAMSHAFT POSITION SENSOR (K44) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the CMP Sensor (K44) Signal circuit at the CMP Sensor harness connector.

Is there continuity between ground and the CMP (K44) Sensor Signal circuit?

Yes

- Repair the CMP Sensor (K44) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [13](#)

13. CHECK FOR THE CAMSHAFT POSITION (K44) SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) SENSOR GROUND CIRCUIT

1. Check for continuity between the CMP Sensor (K44) Signal circuit and the (K944) Sensor Ground circuit at the CMP Sensor harness connector.

Is there continuity between the CMP Sensor (K44) Signal circuit and the (K944) Sensor Ground circuit?

Yes

- Repair the CMP Sensor (K44) Signal circuit for a short to the (K944) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [14](#)

14. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0341-00-CAMSHAFT POSITION SENSOR - PERFORMANCE BANK 1 - SENSOR 1

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Camshaft Position (CMP) Sensor is a hall effect type sensor. The sensor produces a 5 Volt digital signal (square wave). The PCM provides a 5 Volt supply, 5 Volt sensor signal and ground to the CMP Sensor. The sensor is positioned near the right front of the Timing Cover. As the camshaft rotates, the eccentric passes closely to the CMP sensor triggering the hall-effect switch causing the digital switching of the sensor signal from high (5 Volts) to low (0 Volts).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- While cranking engine.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a signal from the Camshaft Position Sensor when the Crankshaft Position Sensor indicates engine RPM.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CMP 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
CMP SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
CAMSHAFT POSITION SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CMP SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CMP 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT
CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K944) CMP SENSOR GROUND CIRCUIT
CAMSHAFT POSITION SENSOR (CMP)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE CAMSHAFT POSITION SENSOR (K44) SIGNAL CIRCUIT

1. Turn the ignition off.
2. Disconnect the CMP Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the CMP Sensor (K44) Signal circuit at the CMP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Go To [4](#)

Voltage is between 4.8 and 5.2 volts

- Go To [5](#)

Voltage is below 4.8 volts

- Go To [11](#)

4. CHECK THE CAMSHAFT POSITION (K44) SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Remove the ASD Relay.
4. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
5. Turn the ignition on.
6. Measure the voltage of the CMP Position Sensor (K44) Signal circuit at the CMP Sensor harness connector.

Is the voltage below 1.0 volt?

Yes

- Go To [14](#)

No

- Repair the Camshaft Position Sensor (K44) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT

1. Measure the voltage of the (K844) 5-Volt Supply circuit at the CMP Sensor harness connector.

Select the appropriate voltage reading.

Voltage is above 5.2 volts

- Repair the (K844) 5-Volt Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

Voltage is between 4.8 and 5.2 volts

- Go To [6](#)

Voltage is below 4.8 volts

- Go To [8](#)

6. CHECK THE (K944) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the (K944) Sensor Ground circuit between the CMP Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (K944) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK FOR A DAMAGED CAMSHAFT POSITION SENSOR OR CAMSHAFT

1. Turn the ignition off.
2. Remove the CMP Sensor.
3. Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks.
4. Inspect the Camshaft Tone Wheel for conditions such as damage, debris or cracked teeth.

Is there any evidence of these conditions?

Yes

- Replace the damaged Camshaft Position Sensor or Camshaft Tone Wheel in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [14](#)

8. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the (K844) 5-Volt Supply circuit between the PCM C2 harness connector and the CMP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the (K844) 5-Volt Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE (K844) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the (K844) 5-Volt Supply circuit at the CMP Sensor harness connector.

Is there continuity between ground and the (K844) 5-Volt Supply circuit?

Yes

- Repair the (K844) 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK FOR THE (K844) 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K944) SENSOR GROUND CIRCUIT

1. Check for continuity between the (K844) 5-Volt Supply circuit and the (K944) Sensor Ground circuit at the CMP Sensor harness connector.

Is there continuity between the (K844) 5-Volt Supply circuit and the (K944) Sensor Ground circuit?

Yes

- Repair the (K844) 5-Volt Supply circuit for a short to the (K944) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [14](#)

11. CHECK THE CAMSHAFT POSITION SENSOR (K44) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.

3. Measure the resistance of the CMP Sensor (K44) Signal circuit between the PCM C2 harness connector and the CMP Sensor harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [12](#)

No

- Repair the CMP Sensor (K44) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK THE CAMSHAFT POSITION (K44) SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the CMP Sensor (K44) Signal circuit at the CMP Sensor harness connector.

Is there continuity between ground and the CMP Sensor (K44) Signal circuit?

Yes

- Repair the CMP Sensor (K44) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [13](#)

13. CHECK FOR THE CAMSHAFT POSITION SENSOR (K44) SIGNAL CIRCUIT SHORTED TO THE (K944) SENSOR GROUND CIRCUIT

1. Check for continuity between the CMP Sensor (K44) Signal circuit and the (K944) Sensor Ground circuit at the CMP Sensor harness connector.

Is there continuity between the CMP Sensor (K44) Signal circuit and the (K944) Sensor Ground circuit?

Yes

- Repair the) CMP Sensor (K44) Signal circuit for a short to the (K944) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [14](#)

14. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0381-00-WAIT-TO-START LAMP INOPERATIVE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Glow Plug Module has communicated an error via LIN BUS to the Powertrain Control Module (PCM).

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED B(+) CIRCUIT OPEN/HIGH RESISTANCE
MODULE GROUND CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT
GLOW PLUG MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

NOTE: Repair any LIN BUS related DTCs before continuing with this DTC.

Are there any LIN BUS DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [2](#)

2. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [3](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK THE FUSED (B+) (A29) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

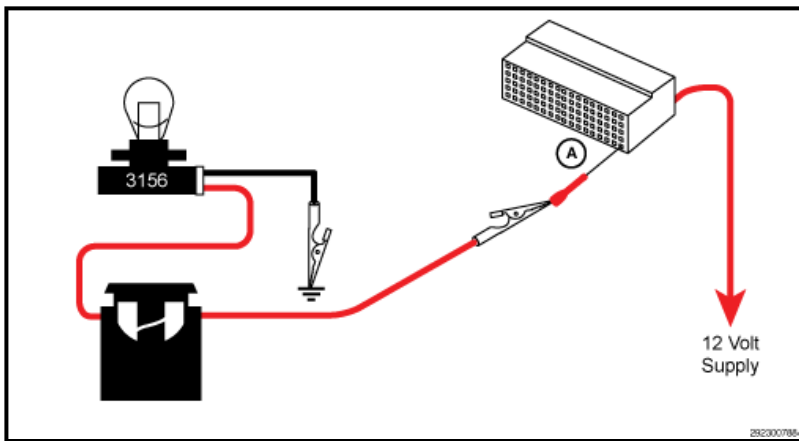
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (Z909) MODULE GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

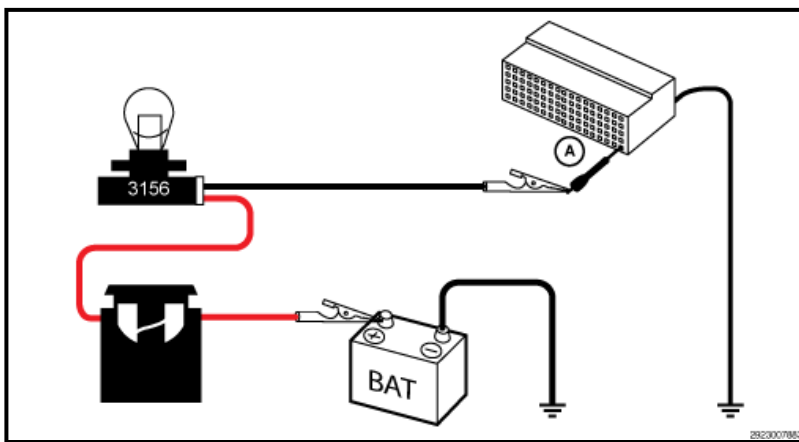
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. REPLACE THE GLOW PLUG MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Glow Plug Module in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty Glow Plug Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0396-00-CYLINDER 1 PRESSURE SENSOR CIRCUIT RANGE-PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an error with the Cylinder 1 Glow Plug / Pressure Sensor.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR (K701) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR (K702) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Cylinder 1 Glow Plug / Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Cylinder 1 Glow Plug / Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0397-00-CYLINDER 1 PRESSURE SENSOR CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Cylinder 1 Glow Plug / Pressure Sensor circuit is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR (K701) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. REPLACE THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Cylinder 1 Glow Plug / Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the faulty Cylinder 1 Glow Plug / Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.

5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0398-00-CYLINDER 1 PRESSURE SENSOR CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Cylinder 1 Glow Plug / Pressure Sensor circuit is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
CYLINDER 1 GLOW PLUG / PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR (K701) SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR (K702) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. REPLACE THE CYLINDER 1 GLOW PLUG / PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Cylinder 1 Glow Plug / Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Cylinder 1 Glow Plug / Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.

3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P0401-00-EGR FLOW INSUFFICIENT DETECTED

THEORY OF OPERATION

The EGR Airflow Control Valve is a pulse width modulated output, controlled by the Powertrain Control Module (PCM). The EGR Airflow Control Valve is used to control the ratio of fresh air flow to EGR gas air flow. The PCM monitors this ratio with the Mass Air Flow Sensor. The Mass Air Flow Sensor feedback is very prominent in determining the position of the EGR Airflow Control Valve. If the Mass Air Flow Sensor feedback does not match what the PCM is expecting to see when EGR air flow is requested, it can effect the operation of the EGR Valve and the EGR Airflow Control Valve. This can occur if the Mass Air Flow Sensor feedback is

faulty or inaccurate, even if no DTCs are actively set. The EGR system and Diesel Particulate Filter regeneration is disabled when the fault is active.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0401-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the SHU mode.

The PCM uses the P04DD-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects EGR flow is less than the requested flow for 15.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
INTAKE SYSTEM AIR LEAKS OR RESTRICTIONS
EGR AIR FLOW CONTROL VALVE
EGR SYSTEM LEAKS
EGR COOLER AND TUBES RESTRICTED
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any Mass Air Flow Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT THE AIR FILTER FOR EXCESSIVE DIRT OR DEBRIS

1. Turn the ignition off.

2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR A RESTRICTION

1. Visually inspect the fresh air inlet tube for a blockage due to snow, ice or dirt buildup.

2. Visually inspect the intake system, exhaust system and related tubes and connections.

NOTE: Inspect all air intake, crankcase vent and Turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#) .

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Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE EGR SYSTEM FOR LEAKS

1. Visually inspect the EGR system for signs of a leak.
2. Look for soot streaks around the valve and connections that would indicate a leak.

Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE EGR AIR FLOW CONTROL VALVE FOR PROPER OPERATION

1. Disconnect the air tube at the inlet port of the EGR Air Flow Control Valve.
2. Use a mirror to observe the motion of the EGR Air Flow Control Valve.
3. Turn the ignition on.
4. The EGR Air Flow Control Valve should open completely without binding with the ignition on.

NOTE: **Cycle the ignition on and off several times while observing the operation of the valve.**

Did the EGR Air Flow Control Valve operate correctly and without binding?

Yes

- Go To [8](#)

No

- Replace the EGR Air Flow Control Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK THE EGR COOLER AND TUBES FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive soot build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.

Were any problems found?

Yes

- Clean or replace the EGR Cooler or tubes as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0402-00-EGR FLOW EXCESSIVE DETECTED

THEORY OF OPERATION

The EGR Airflow Control Valve is a pulse width modulated output, controlled by the Powertrain Control Module (PCM). The EGR Airflow Control Valve is used to control the ratio of fresh air flow to EGR gas air flow. The PCM monitors this ratio with the Mass Air Flow Sensor. The Mass Air Flow Sensor feedback is very prominent in determining the position of the EGR Airflow Control Valve. If the Mass Air Flow Sensor feedback does not match what the PCM is expecting to see when EGR air flow is requested, it can effect the operation of the EGR Valve and the EGR Airflow Control Valve. This can occur if the Mass Air Flow Sensor feedback is faulty or inaccurate, even if no DTCs are actively set. The EGR system and Diesel Particulate Filter regeneration is disabled when the fault is active.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0401-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the SHU mode.

The PCM uses the P04DD-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running and ambient temperature above 19.4Â°F (-7Â°C).

SET CONDITION

- The Powertrain Control Module (PCM) detects EGR flow is more than the requested flow for 10.0 seconds.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
INTAKE SYSTEM AIR LEAKS OR RESTRICTIONS
EGR AIR FLOW CONTROL VALVE
EGR COOLER AND TUBES RESTRICTED
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Mass Air Flow Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT THE AIR FILTER FOR EXCESSIVE DIRT OR DEBRIS

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR A RESTRICTION

1. Visually inspect the fresh air inlet tube for a blockage due to snow, ice or dirt buildup.
2. Visually inspect the intake system, exhaust system and related tubes and connections.

NOTE: Inspect all air intake, crankcase vent and Turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [**INTAKE AIR SYSTEM LEAK DETECTION**](#) .

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Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **6**

6. CHECK THE EGR AIR FLOW CONTROL VALVE FOR PROPER OPERATION

1. Disconnect the air tube at the inlet port of the EGR Air Flow Control Valve.
2. Use a mirror to observe the motion of the EGR Air Flow Control Valve.
3. Turn the ignition on.
4. The EGR Air Flow Control Valve should open completely without binding with the ignition on.

NOTE: **Cycle the ignition on and off several times while observing the operation of the valve.**

Did the EGR Air Flow Control Valve operate correctly and without binding?

Yes

- Go To **7**

No

- Replace the EGR Air Flow Control Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

7. CHECK THE EGR COOLER AND TUBES FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive soot build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: **Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.**

Were any problems found?

Yes

- Clean or replace the EGR Cooler or tubes as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0403-00-EGR CONTROL CIRCUIT OPEN

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the EGR Solenoid command off.

SET CONDITION

- The PCM detects an open on the EGR Solenoid Control circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR CONTROL (+) CIRCUIT OPEN/HIGH RESISTANCE
EGR CONTROL (-) CIRCUIT OPEN/HIGH RESISTANCE
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR (K682) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.

2. Disconnect the EGR Valve harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the EGR (K682) Control circuit between the EGR Valve harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the EGR Control (K682) circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE EGR (K684) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the EGR (K684)Control circuit between the EGR Valve harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the EGR (K684) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. INSTALL A NEW EGR VALVE AND RETEST FOR DTC

1. Install a new EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine and test drive the vehicle until the engine reaches operating temperature.
5. With the scan tool, read DTCs and record on the repair order.

Did the DTC return?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0404-00-EGR "A" CONTROL CIRCUIT RANGE/PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- HP EGR Valve enabled.
- Battery voltage between 10.5 and 16.0 volts.

SET CONDITION

- The PCM detects an short circuit overload or under voltage condition on the HP EGR Valve Control H-Bridge circuitry for 0.10 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HP EGR VALVE MOTOR CONTROL (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE
HP EGR VALVE MOTOR CONTROL (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE
HP EGR VALVE MOTOR CONTROL (+) CIRCUIT FOR A SHORT TO GROUND
HP EGR VALVE MOTOR CONTROL (-) CIRCUIT FOR A SHORT TO GROUND
HP EGR VALVE ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE EGR MOTOR (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE MOTOR (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE EGR MOTOR (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE EGR MOTOR (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. EGR VALVE ASSEMBLY

1. Turn the ignition off.
2. Reconnect the PCM C2 harness connector.
3. Replace the EGR Valve Assembly in accordance with the Service Information.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
6. Test drive the vehicle while monitoring the scan tool.
7. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [7](#)

No

- Test complete.

- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. POWERTRAIN CONTROL MODULE (PCM)

1. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the EGR Airflow Control Valve and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0405-00-EGR POSITION SENSOR CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the EGR Signal circuit voltage is below the calibrated threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VALVE 5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND
EGR POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EGR POSITION SIGNAL CIRCUIT SHORTED TO GROUND
EGR POSITION SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE (K834) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Valve Assembly harness connector.
3. Turn the ignition on.
4. Measure the voltage on the (K834) 5-Volt Supply circuit at the EGR Valve Assembly harness connector.

Is the measurement above 4.8 volts?

Yes

- Go To [4](#)

No

- Repair the (K834) Valve 5-Volt Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE EGR POSITION (K683) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Check for continuity between ground and the EGR Position (K683) Signal circuit at the EGR Valve Assembly.

Is there continuity between ground and the EGR (K683) Position Signal circuit?

Yes

- Repair the EGR Position (K683) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE EGR POSITION (K683) SIGNAL CIRCUIT FOR A SHORT TO THE (K934) SENSOR GROUND CIRCUIT

1. Check for continuity between the EGR Position (K683) Signal circuit and the (K934) Sensor Ground circuit at the EGR Valve Assembly.

Is there continuity between the EGR Position (K683) Signal circuit and the (K934) Sensor Ground circuit?

Yes

- Repair the between the EGR Position (K683) Signal circuit and the (K934) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE EGR POSITION (K683) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the EGR Position (K683) Signal circuit between the EGR Valve Assembly harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the EGR Position (K683) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE ABILITY OF THE PCM TO READ THE EGR POSITION SIGNAL

1. Reconnect the EGR Valve Assembly harness connector.
2. Reconnect the PCM C2 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the EGR Valve Assembly harness connector.
7. Connect a jumper between the EGR Position (K683) Signal circuit and the (K834) 5-Volt Supply circuit at the EGR Valve Assembly harness connector.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

NOTE: **The scan tool should display a P0406-EGR Position Sensor Circuit High DTC as active or pending with the jumper in place.**

Does the scan tool display the DTC as described above?

Yes

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0406-00-EGR POSITION SENSOR CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the EGR Valve Signal circuit voltage is above 4.4 Volts for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
EGR POSITION SIGNAL CIRCUIT SHORTED TO THE EGR VALVE 5-VOLT SUPPLY CIRCUIT
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE EGR POSITION (K683) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Valve harness connector.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the TIPM.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of the EGR Position (K683) Signal circuit at the EGR Valve harness connector.

Is there any voltage present on the circuit?

Yes

- Repair the EGR Position (K683) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE EGR POSITION (K683) SIGNAL CIRCUIT FOR A SHORT TO THE (K834) 5-VOLT SUPPLY CIRCUIT

1. Turn the ignition off.
2. Remove the jumper and install the ASD Relay.
3. Measure the resistance between the EGR Position (K683) Signal circuit and the (K834) 5-Volt Supply circuit at the EGR Valve harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the EGR Position (K683) Signal circuit and the (K834) 5-Volt Supply circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE (K934) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K934) Sensor Ground circuit between the EGR Valve harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K934) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE ABILITY OF THE PCM TO READ THE EGR VALVE POSITION SENSOR SIGNAL

1. Connect the EGR Valve Assembly harness connector.
2. Connect the PCM C2 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the EGR Valve Assembly harness connector.
7. Connect a jumper between ground and the EGR Position (K683) Signal circuit at the EGR Valve Assembly harness connector.
8. Turn the ignition on.
9. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0405-00 EGR Position Sensor Circuit Low DTC with the jumper in place.

Does the scan tool display P0405-00 EGR Position Sensor Circuit Low DTC as described above?

Yes

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P0128-00 To P025A-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P0128-00-THERMOSTAT RATIONALITY

THEORY OF OPERATION

The Coolant Thermostat is a flow regulating valve that separates the engine cooling circuit from the radiator cooling circuit governed by coolant temperature. The coolant thermostat's purpose is to control the coolant flow to regulate the engine coolant at a predetermined temperature. A properly functioning thermostat allows the coolant temperature in the engine part of the cooling system circuit to warm up quickly to the desired temperature. Once the desired coolant temperature is reached, the thermostat controls the coolant flow from the engine to the outer, radiator circuit to maintain a constant coolant temperature. The thermostat is made to only open fully at the desired coolant temperature. A low engine coolant temperature results in high hydrocarbon and CO engine-out emissions due to relatively low temperatures of the combustion chamber walls. Due to this emissions increase it is necessary to detect a malfunctioning thermostat. The diagnostic is conducted during the warm-up phase of the engine as well as during steady state engine operations to monitor any potential coolant temperature drop below a defined temperature limit.

This diagnostic detects Thermostat stuck open failures. This can result in coolant warm-up delay or coolant temperature drop during engine operation. The warm-up behavior test monitors the measured engine coolant temperature for warm-up after engine start. The measured temperature is compared to a model of engine coolant temperature based on normal warm up characteristics. The steady-state test monitors engine coolant temperature drop during engine operation. The described rationality checks will detect coolant thermostat (coolant temperature below thermostat regulating temperature) failures.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the engine running.
- Start up coolant temperature less than 65B°C (149B°F).
- Ambient temperature between -8B°C (17.6B°F) and 50B°C (122B°F).
- Average vehicle speed greater than 16 km/h (10 mph) until coolant temperature reaches 85B°C.
- Engine speed does not go above 5400 rpm for more than 32 seconds.
 - The pass/fail determination point is reached when the coolant temp model reaches 88B°C (190.4B°F).

SET CONDITION

- The predicted coolant temperature reaches the target threshold before the actual coolant temperature and the PCM detects that the actual engine coolant temperature is too far below what is acceptable for a good thermostat.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW COOLANT LEVEL
COOLING SYSTEM ISSUES - POOR FLOW DUE TO A RESTRICTION OR MECHANICAL ISSUE
FAULTY THERMOSTAT - OPENING TOO SOON

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

NOTE: Make sure the coolant level and condition are within specifications before continuing with this Diagnostic.

NOTE: **DANGER:** Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or fatal injury. Allow the engine to cool before opening the cooling system.

1. Refer to the recorded DTCs.

Are there any Engine Coolant Temperature, Ambient Air Temperature, Camshaft Position, or Crankshaft Position Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE COOLANT LEVEL AND CONDITION

WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in possible serious or fatal injury. Allow the engine to cool before opening the cooling system.

1. Inspect the Engine Coolant for proper level and condition. Refer to **COOLING SYSTEM** .

Is the Engine Coolant at the proper level and condition?

Yes

- Go To **4**

No

- Repair the Engine Coolant level or condition problem. Inspect the vehicle for coolant leaks and repair if necessary. Fill the Engine Coolant to the proper level and ensure the proper condition. Refer to **COOLING SYSTEM** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE THERMOSTAT FOR PROPER OPERATION

NOTE: **This test works best if performed on a cold engine (cold soak).**

1. Ignition on, engine not running.
2. With the scan tool, read the ECT Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a value that is somewhere close to the ambient temperature.
3. Start the Engine.
4. During engine warm-up, monitor the ECT Temperature value on the scan tool. The temperature value change should be a smooth transition from start up to normal operating temp 88B°C (190B°F). Also monitor the actual coolant temperature with a thermometer.

NOTE: **As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool, ECT Temperature value should stay relatively close to each other.**

5. Using the appropriate service information, determine the proper opening temperature of the thermostat.

Did the Thermostat open at the proper temperature?

Yes

- Go To **5**

No

- Replace the Thermostat in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE RADIATOR FOR RESTRICTIONS AND FLOW

NOTE: **The engine must be running and the Thermostat open to perform this test.**

1. Check and compare the temperatures at the inlet and outlet of the Radiator. Check for proper operation of the entire cooling system. Be certain to check for proper operation of the Radiator Cap. Check for proper flow through the Radiator and anything that can cause a lack of system pressure or lack of coolant flow in the system which include air in the cooling system, proper operation of the Water Pump and drive belt, restricted Radiator core, collapsed hose restricting flow, etc.

NOTE: It is normal to see a lower temperature on the outlet of the Radiator, however a very large difference could indicate a restriction in the Radiator. This condition can cause this DTC to set due to the position of the ETC Sensor in the coolant system. If necessary, compare the temperature difference with a similar vehicle.

Was the difference in the temperature readings relatively larger than expected?

Yes

- Check the cooling system and Radiator for proper flow and repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Thermostat in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P012C-00-TURBOCHARGER/SUPERCHARGER INLET PRESSURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Inlet Air Pressure Signal is below 0.2 Volts for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INLET AIR PRESSURE SIGNAL SHORT TO GROUND
MASS AIR FLOW / INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Diagnose and repair any 5-Volt Reference DTCs before continuing with this test procedure.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE INLET AIR PRESSURE (K68) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the Inlet Air Pressure (K68) Signal circuit at the MAF/Intake Air Sensor harness connector.

Is there continuity between ground and the Inlet Air Pressure (K68) Signal circuit?

Yes

- Repair the Inlet Air Pressure (K68) Signal circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

3. CHECK THE ABILITY OF THE PCM TO MONITOR THE MAF/INTAKE AIR SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool check for PCM DTCs.

NOTE: The DTC - P0103-00 MASS AIR FLOW SENSOR CIRCUIT HIGH should display as active or pending with the MAF/Intake Air Sensor harness connector disconnected.

5. While monitoring the scan tool, connect a jumper between the MAF Sensor (K142) Signal circuit and the Sensor (K757) Ground circuit in the MAF/Intake harness connector.

NOTE: **With the jumper in place the scan tool should display DTC- P0102-00 MASS AIR FLOW SENSOR CIRCUIT LOW.**

Does the scan tool display as described above?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P012D-00-TURBOCHARGER/SUPERCHARGER INLET PRESSURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the Inlet Air Pressure Signal is above a calibrated threshold for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INLET AIR PRESSURE SIGNAL SHORT TO VOLTAGE
INLET AIR PRESSURE SIGNAL OPEN/HIGH RESISTANCE
MASS AIR FLOW / INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE (K68) INLET AIR PRESSURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Turn the ignition on, engine not running.
4. Measure the voltage on the (K68) Inlet Air Pressure Signal circuit at the MAF/Intake Air Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the (K68) Inlet Air Pressure Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE (K68) INLET AIR PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Turbocharger/Supercharger Inlet Pressure Sensor (K68) Signal circuit between the MAF/Intake Air Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Repair the Turbocharger/Supercharger Inlet Pressure Sensor (K68) Signal circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO READ THE TURBOCHARGER/SUPERCHARGER INLET PRESSURE (K68) SENSOR

1. Turn the ignition off.
2. Connect the PCM harness connector(s).
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The DTC - P012C-00 TURBOCHARGER/SUPERCHARGER INLET PRESSURE SENSOR CIRCUIT LOW should display as active or pending with the harness connector disconnected. The engine may need to be running depending on the current PCM software calibration for this code to set. You may need to plug in the MAF/Intake Air Sensor harness connector to start the engine, then disconnect the connector with the engine running to get this code to set.

5. Turn the ignition off.
6. Turn the ignition on.
7. With the scan tool, clear DTCs.
8. Turn the ignition off.
9. Connect a fused jumper between the (K68) Turbocharger/Supercharger Inlet Pressure Sensor (K68) Signal circuit and the (K757) Sensor Ground circuit at the MAF/Intake Air Sensor harness connector.
10. Turn the ignition on.
11. With the scan tool, read DTCs.
12. The DTC - P012D-00 TURBOCHARGER/SUPERCHARGER INLET PRESSURE SENSOR CIRCUIT HIGH should display as active or pending.

Does the scan tool display as described above?

Yes

- Replace the MAF Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P012F-00-ENGINE COOLANT TEMPERATURE / ENGINE OIL TEMPERATURE CORRELATION

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Powertrain Control Module (PCM) performs a rationality check by comparing the Engine Coolant Temperature (ECT) Sensor and the Engine Oil Temperature (EOT) Sensor after a sufficient amount of engine-off time.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a rationality comparison between the Engine Coolant Temperature (ECT) Sensor and the Engine Oil Temperature (EOT) Sensor that is beyond a calibrated threshold for a pre-determined amount of time.

DEFAULT ACTION

- The MIL will illuminate.
- ETC light will illuminate.
- Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
ENGINE COOLANT TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0116, P0117 or P0118 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **[3.0L DIESEL - DIAGNOSTIC CODE INDEX](#)**.

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO READ THE ENGINE COOLANT TEMPERATURE SENSOR

1. Disconnect the Engine Coolant Temperature Sensor harness connector.
2. Turn the ignition on.
3. With the scan tool, read DTCs.

NOTE: The DTC - P0118-00 ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH should display as active or pending with the Engine Coolant Temperature Sensor harness connector disconnected.

4. Turn the ignition off.
5. Connect a fused jumper between the Engine Coolant Temperature (K2) Signal circuit and the Sensor (K200) Return circuit at the Engine Coolant Temperature Sensor harness connector.
6. Turn the ignition on.
7. With the scan tool, read DTCs.

NOTE: The DTC - P0117-00 ENGINE COOLANT TEMPERATURE SENSOR 1 CIRCUIT LOW should display as active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Replace the Engine Coolant Temperature Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0131-00-O2 SENSOR 1/1 CIRCUIT LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage between 11.0 and 15.75 volts.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the O2 Sensor 1/1 Signal circuit is below the calibrated threshold for 9.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO THE O2 SENSOR 1/1 HEATER GROUND CIRCUIT
O2 SENSOR 1/1

Possible Causes

POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **2**

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To **3**

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the O2 Sensor 1/1 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between ground and the O2 Sensor 1/1 (K41) Signal circuit at the O2 Sensor 1/1 harness connector.

Is there continuity between ground and the O2 Sensor 1/1 (K41) Signal circuit?

Yes

- Repair the O2 Sensor 1/1 (K41) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT SHORTED TO THE (K902) SENSOR GROUND CIRCUIT

1. Check for continuity between the O2 Sensor 1/1 (K41) Signal circuit and the (K902) Sensor Ground circuit in the O2 Sensor 1/1 harness connector.

Is there continuity between the O2 Sensor 1/1 (K41) Signal circuit and the (K902) Sensor Ground circuit?

Yes

- Repair the short between the O2 Sensor 1/1 (K41) Signal circuit and the (K902) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE O2 SENSOR HARNESS CONNECTOR

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Start the engine and allow it to idle.
4. With the scan tool, read the O2 Sensor 1/1 Signal voltage.

Is the O2 Sensor 1/1 voltage above 4.0 volts?

Yes

- Replace the O2 Sensor 1/1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0132-00-O2 SENSOR 1/1 CIRCUIT HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine

the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1, 000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage between 11.0 and 15.75 volts.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Oxygen Sensor 1/1 (0-1) differential signal voltage is above 1.2 volts for over 9.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 HEATER GROUND CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
O2 SENSOR 1/1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 RETURN CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE CONDITION

1. Start the engine and allow it to idle for at least 60 seconds.

WARNING:

When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts or fan. Do not wear loose clothing. Failure to follow these instructions may result in possible serious or fatal injury.

2. With the scan tool, read the O2 Sensor 1/1 signal voltage.

Is the voltage staying above 4.0 volts?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE O2 SENSOR 1/1 HEATER OPERATION

1. With the scan tool, check the O2 Sensor 1/1 heater duty cycle. Also monitor the O2 Sensor 1/1 heater temperature and compare to the other O2 Sensor heater temperatures.

NOTE: The heater duty cycle percentage and heater temperature should be relatively close to the other sensors. If there is an issue with the O2 Sensor heater or circuitry the PCM will disable the heater driver and the duty cycle will be 0 percent. Any issues in the heater circuitry, even a small amount of resistance, will cause the temperature reading to be noticeably different than the other O2 Sensors.

Is the O2 Sensor heater operating properly?

Yes

- Go To [7](#)

No

- Go To [3](#)

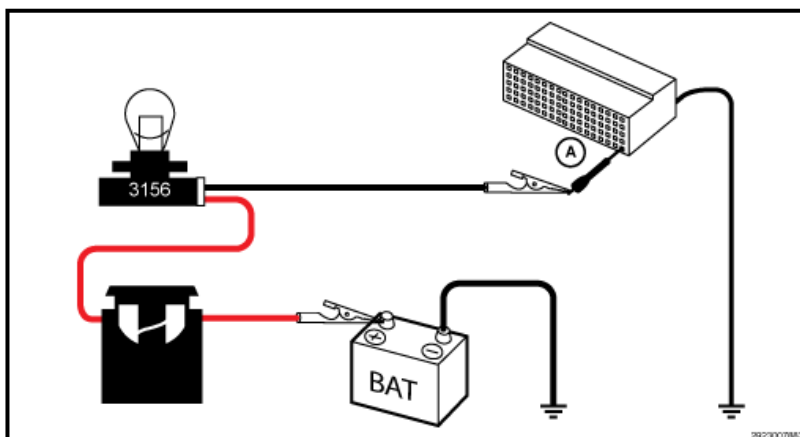
3. CHECK THE O2 SENSOR 1/1 (K902) GROUND (SENSOR RETURN) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

1. Turn the ignition off.
2. Disconnect the O2 Sensor 1/1 harness connector.

CAUTION: Do not load test any circuits with components still connected to the circuit.

3. Load test the O2 Sensor 1/1 (K902) Ground (Sensor Return) circuit at the O2 Sensor 1/1 harness connector. **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the O2 Sensor 1/1 (K902) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR A SHORT TO ANOTHER VOLTAGE SUPPLY CIRCUIT

1. Disconnect the PCM C1 harness connector.
2. Check for continuity between the O2 Sensor 1/1 (K79) Heater Control circuit and all other circuits at the PCM C1 connector

Is there continuity between the O2 Sensor 1/1 (K79) Heater Control circuit and any other circuit?

Yes

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for a short to the circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the O2 Sensor 1/1 (K79) Heater Control circuit at the O2 Sensor 1/1 harness connector.

Is there continuity between ground and the O2 Sensor 1/1 (K79) Heater Control circuit?

Yes

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

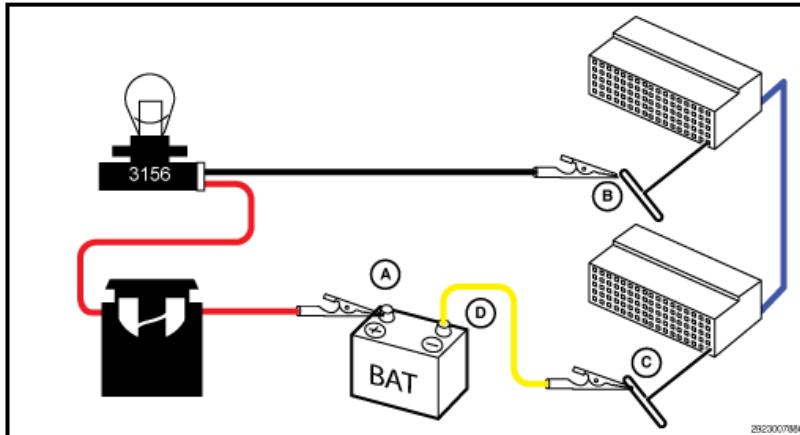
6. ISOLATE AND LOAD TEST THE O2 SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT TO CHECK FOR OPEN/HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information

and alternative methods of load testing or voltage drop testing a circuit.
Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the O2 Sensor 1/1 (K79) Heater Control circuit.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [10](#)

No

- Repair the O2 Sensor 1/1 (K79) Heater Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition on, engine not running.
2. Measure the voltage on the O2 Sensor 1/1 (K41) Signal circuit at the O2 Sensor 1/1 harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the O2 Sensor 1/1 (K41) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.

2. Measure the resistance of the O2 Sensor 1/1 (K41) Signal circuit between the O2 Sensor 1/1 harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [9](#)

No

- Repair the (K41) O2 Sensor 1/1 Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE O2 SENSOR 1/1 (K902) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the O2 Sensor 1/1 (K902) Return circuit between the O2 Sensor 1/1 harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [10](#)

No

- Repair the O2 Sensor 1/1 (K902) Return circuit for a an open or high resistance. If the O2 Sensor 2/1 Signal Circuit High DTC is also active it would indicate that the open is most likely before the splice in the return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. REPLACE THE O2 SENSOR 1/1 AND RETEST FOR DTC

1. Replace the O2 Sensor 1/1 in accordance with the Service Information.
2. Connect the O2 Sensor 1/1 and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Freeze Frame and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [11](#)

No

- Replacing the O2 Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).

4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0133-00-O2 SENSOR 1/1 SLOW RESPONSE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Powertrain Control Module (PCM) monitors the exhaust gases for oxygen content and varies the rich/lean fuel mixture of the intake air fuel mixture to adjust the system. The monitor evaluates response time of the O2 Sensor during transition from load to overrun mode using the O2 concentration (corrected for exhaust pressure) signal. The PCM will illuminate the MIL lamp when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ECT above 70B°C (158B°F).
- Engine speed between 1400 and 2300 rpm.
- Vehicle speed between 64 and 96 km/h (40 and 60 mph).
- Engine run time greater than three minutes.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Oxygen Sensor signal does not switch adequately during monitoring.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 SIGNAL CIRCUIT OPEN OR SHORTED
O2 SENSOR 1/1 RETURN CIRCUIT OPEN OR SHORTED
O2 SENSOR 1/1 HEATER CIRCUITS OPEN OR SHORTED
RESTRICTED INTAKE AIR FLOW (PLUGGED AIR FILTER)
LEAK IN THE EXHAUST SYSTEM
UPSTREAM AND DOWNSTREAM O2 SENSOR HARNESS CONNECTORS SWITCHED
O2 SENSOR 1/1 INSTALLED INCORRECTLY
O2 SENSOR 1/1
ENGINE MECHANICAL ISSUE CAUSING O2 SENSOR CONTAMINATION
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

NOTE: Any O2 Sensor heater or signal circuit DTCs should be diagnosed before continuing with this procedure.

Are there any O2 Sensor heater or signal circuit DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [4](#)

4. CHECK THE INTAKE SYSTEM AND AIR FILTER FOR RESTRICTIONS OR BLOCKAGE

1. Check for a blockage in the intake air system plumbing.
2. Visually inspect the Air Filter for a restriction.

NOTE: Poor airflow due to a severely restricted Air Filter can cause this DTC to set.

Were any issues found?

Yes

- Replace the Air Filter or repair the blockage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE O2 SENSOR FOR PROPER MOUNTING

1. Check and verify that the Upstream O2 Sensor is mounted correctly into the exhaust. Verify the sensor is tight and not cross threaded.

Is the O2 Sensor mounted correctly?

Yes

- Go To [6](#)

No

- Mount the O2 Sensor correctly.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE ORIENTATION OF THE UPSTREAM AND DOWNSTREAM O2 SENSOR HARNESS CONNECTORS

1. Check and verify that the Upstream O2 Sensor and Downstream O2 Sensor harness connectors are properly connected to the correct sensors.

Are the harness connectors reversed?

Yes

- Connect the harness connectors to the correct sensors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK EGR SYSTEM FOR A LEAK

1. Look for visible signs (soot streaks) of an external EGR leak.

Were any EGR leaks found?

Yes

- Perform the appropriate repairs to the EGR system.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Perform the CHECKING THE EXHAUST SYSTEM FOR LEAKS test procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any exhaust leaks found?

Yes

- Repair or replace the leaking exhaust parts as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. REPLACE THE O2 SENSOR 1/1 AND RETEST FOR DTC

NOTE: Check for signs of contaminants that may have damaged the O2 Sensor, such as contaminated fuel, unapproved silicone, oil and coolant.

1. Replace the O2 Sensor 1/1 in accordance with the Service Information.
2. Connect the O2 Sensor 1/1 and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded Freeze Frame and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the O2 Sensor 1/1 repaired the fault. If the O2 Sensor was contaminated, also correct the engine mechanical condition that caused the contamination.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0134-00-O2 SENSOR CIRCUIT NO ACTIVITY DETECTED-BANK 1 SENSOR 1

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM has detected that the Oxygen Sensor is no communicating properly.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 RETURN CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 POSITIVE CURRENT CONTROL CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND CHECK THE OXYGEN SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE OXYGEN SENSOR 1/1 (K79) HEATER CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE OXYGEN SENSOR 1/1 (K902) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE OXYGEN SENSOR 1/1 (K89) POSITIVE CURRENT CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. REPLACE THE OXYGEN SENSOR (O2) AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P015E-00-EXCESSIVE TIME TO ENTER CLOSED LOOP FUEL TIMING CONTROL

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Injector timing controls and the time it takes for them to enter closed loop by using **Zero Fuel Calibration (ZFC)** . Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. There are two separate timers to monitor ZFC, a short-term timer and a long-term timer as described below.

Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. In an overrun/deceleration fuel shut-off condition, fuel rail pressure is set to a fixed value and small fuel injections are made on the respective injectors. The observed acceleration in crankshaft speed is detected and compared to the expected acceleration. If the observed acceleration deviates from the expected acceleration by a calibrated value, then an additional routine is called which adjusts the injection energizing time until the observed acceleration matches the expected value. This information is then used to adjust all pilot injections on that injector to ensure correct fuel delivery.

Short Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with short term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the short term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The short-term timer measures the length of time it takes to enter closed loop compared to the ZFC diagnostic last run. The short term timer runs under more stringent conditions when it is likely that the closed loop ZFC will be active.

Long Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with long term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the long term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The long-term timer runs any time it is possible for the closed loop ZFC, to be active.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Closed loop check has not been performed during this drive cycle.
- Barometric pressure is greater than a calibrated value.
- Battery voltage is greater than a calibrated value.
- Modeled exhaust gas temperature is less than or equal to a calibrated value.

SET CONDITION

- The closed loop fuel timing control has not been achieved in either the short term or long term Zero Fuel Calibration (ZFC) models.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes

POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0106-00, P0107-00, P0108-00, or P0182-00 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P015F-00-EXCESSIVE TIME TO ENTER CLOSED LOOP CYLINDER BALANCE CONTROL

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Injector timing controls and the time it takes for them to enter closed loop by using **Zero Fuel Calibration (ZFC)**. Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. There are two separate timers to monitor ZFC, a short-term timer and a long-term timer as described below.

Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. In an overrun/deceleration fuel shut-off condition, fuel rail pressure is set to a fixed value and small fuel injections are made on the respective injectors. The observed acceleration in crankshaft speed is detected and compared to the expected acceleration. If the observed acceleration deviates from the expected acceleration by a calibrated value, then an additional routine is called which adjusts the injection energizing time until the observed acceleration matches the expected value. This information is then used to adjust all pilot injections on that injector to ensure correct fuel delivery.

Short Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with short term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the short term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The short-term

timer measures the length of time it takes to enter closed loop compared to the ZFC diagnostic last run. The short term timer runs under more stringent conditions when it is likely that the closed loop ZFC will be active.

Long Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with long term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the long term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The long-term timer runs any time it is possible for the closed loop ZFC, to be active.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The PCM detected that closed loop operation has not occurred in the given calibrated amount of time.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR WIRING AND/OR CONNECTIONS
FUEL INJECTORS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel System related DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK FUEL INJECTOR WIRING

1. Check all the wiring going to the Fuel Injectors for any signs of damage or contamination.

Were there any issues found?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE FUEL INJECTORS AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Fuel Injectors in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P016A-00-EXCESSIVE TIME TO ENTER CLOSED LOOP AIR/FUEL RATIO CONTROL

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Injector timing controls and the time it takes for them to enter closed loop by using **Zero Fuel Calibration (ZFC)** . Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. There are two separate timers to monitor ZFC, a short-term timer and a long-term timer as described below.

Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. In an overrun/deceleration fuel shut-off condition, fuel rail pressure is set to a fixed value and small fuel injections are made on the respective injectors. The observed acceleration in crankshaft speed is detected and compared to the expected acceleration. If the observed acceleration deviates from the expected acceleration by a calibrated value, then an additional routine is called which adjusts the injection energizing time until the observed acceleration matches the expected value. This information is then used to adjust all pilot injections on that injector to ensure correct fuel delivery.

Short Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with short term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the short term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The short-term

timer measures the length of time it takes to enter closed loop compared to the ZFC diagnostic last run. The short term timer runs under more stringent conditions when it is likely that the closed loop ZFC will be active.

Long Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with long term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the long term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The long-term timer runs any time it is possible for the closed loop ZFC, to be active.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Ambient air temperature is equal to or greater than a calibrated value
- Engine is operating in working Fuel Mass Observer (FMO) range.
- Initial adaptation of O2 sensor is present.
- Lambda sensor adaptation is complete.
- Fuel quantity is greater than a calibrated threshold.
- Battery voltage is equal to or greater than a calibrated value.
- Barometric pressure is equal to or greater than a calibrated value.
- Air system model is active

SET CONDITION

- The Powertrain Control Module (PCM) determines that the Air/Fuel Ratio control remains in open loop longer than a calibrated amount of time for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE PCM FOR OTHER DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are P016E, P016F, P0087, P0088, any EGR DTCs, any FRP DTCs, any Injector DTCs or any O2 Sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P016D-00-EXCESSIVE TIME TO ENTER CLOSED LOOP FUEL PRESSURE CONTROL

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Injector timing controls and the time it takes for them to enter closed loop by using **Zero Fuel Calibration (ZFC)**. Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. There are two separate timers to monitor ZFC, a short-term timer and a long-term timer as described below.

Zero Fuel Calibration (ZFC) is an algorithm used to detect deviations in individual injector's performance from their nominal behavior. In an overrun/deceleration fuel shut-off condition, fuel rail pressure is set to a fixed value and small fuel injections are made on the respective injectors. The observed acceleration in crankshaft speed is detected and compared to the expected acceleration. If the observed acceleration deviates from the expected acceleration by a calibrated value, then an additional routine is called which adjusts the injection energizing time until the observed acceleration matches the expected value. This information is then used to adjust all pilot injections on that injector to ensure correct fuel delivery.

Short Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with short term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the short term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The short-term timer measures the length of time it takes to enter closed loop compared to the ZFC diagnostic last run. The short term timer runs under more stringent conditions when it is likely that the closed loop ZFC will be active.

Long Term Timer - When the monitor of excessive time to enter closed loop fuel timing control with long term timer is enabled, a respective timer starts to increment. The timer stops when the ZFC learning values have been updated and an overrun has been detected. When this timer value is greater than a calibrated threshold and the closed loop ZFC has not been active within this calibrated amount of time based on the long term timer, the fault of "Excessive time to enter closed loop fuel timing control" will be set. The long-term timer runs any time it is possible for the closed loop ZFC, to be active.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Engine speed is greater than or equal to a calibrated value.
- Ambient air temperature is greater than or equal to a calibrated value.
- Barometric pressure is greater than a calibrated value.
- Battery Voltage is greater than or equal to a calibrated value.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure control remains in open loop longer than a calibrated amount of time for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE PCM FOR OTHER DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are P016E, P016F, P0087, P0088, any EGR DTCs, any FRP DTCs, any Injector DTCs or any O2 Sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P016E-00-CLOSED LOOP FUEL PRESSURE CONTROL AT LIMIT - PRESSURE TOO HIGH

THEORY OF OPERATION

The tests used to diagnose the closed loop fuel rail pressure control system for pressure that is inappropriately high or inappropriately low.

The fuel rail pressure (FRP) sensor is used to measure the fuel pressure in the diesel common rail system. The FRP sensor is the feedback component in a control loop, and informs the Powertrain Control Module (PCM) about the current pressure in the common rail. The PCM controls the desired rail pressure by operating two valves - called fuel metering valve and a pressure control valve. The correctness of the FRP sensor is important since the inaccuracy can lead to an emission disadvantage. Generally, a reduced rail pressure can lead to an increase in soot emissions while reducing engine out NOx emissions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The engine is running.
- Rail pressure control is transitioning to metering unit control mode.
- Rail pressure control is transitioning to pressure control mode or rail pressure control is transitioning to coupled pressure control.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too high for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL QUANTITY SOLENOID
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK THE PCM FOR OTHER DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are there any other DTCs present?

Yes

- Repair the other DTCs before continuing further with this procedure.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **2**

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To **3**

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

3. CHECK THE FUEL SYSTEM FOR A LEAK

1. Turn the ignition off.
2. Inspect the entire fuel system for leakage.

Is there any evidence of leakage?

Yes

- Repair as necessary in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **4**

4. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Inspect the fuel system for contamination in accordance with the Service Information. Refer to **FUEL SYSTEM**.

Is the fuel contaminated?

Yes

- Repair as necessary in accordance with the Service Information.

- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE ENGINE FOR PROPER STARTING AND IDLE CONDITION

1. With the scan tool, erase the PCM DTCs.
2. Attempt to start the engine.

Does the engine start and idle smoothly?

Yes

- Go To [6](#)

No

- Go To [8](#)

6. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER PRESSURE

1. With the scan tool, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure.

NOTE: A sticking Fuel Pressure Regulator is indicated by the Actual Fuel Pressure gradually dropping below the Fuel Pressure Setpoint then suddenly increasing (spiking) above the Fuel Pressure Setpoint.

Does the Actual Fuel Pressure gradually decrease then suddenly increase (spike) above the Fuel Pressure Setpoint?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were there any problems with the Fuel Delivery System?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE FUEL INJECTOR(S) FOR A STUCK OPEN CONDITION

NOTE: An injector that sticks open can cause this DTC. A sticking injector will cause the engine to misfire and emit excessive black smoke from the exhaust system.

Does the engine exhibit the symptoms described in the above note?

Yes

- Using the service information, remove and inspect the Fuel Injectors for signs of damage or debris that may cause the injector to stick. Sticking injectors may cause the combustion chamber to become black and oil soaked. Replace Injector(s) as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK THE FUEL QUANTITY SOLENOID FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Fuel Quantity Solenoid in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase the PCM DTCs.
5. Attempt to start and test drive the vehicle.
6. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Test Complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

10. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Fuel Pressure Regulator in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase the PCM DTCs.
5. Attempt to start and test drive the vehicle.
6. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Replace the High Pressure Delivery Pump in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Test Complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P016F-00-CLOSED LOOP FUEL PRESSURE CONTROL AT LIMIT - PRESSURE TOO LOW

THEORY OF OPERATION

The tests used to diagnose the closed loop fuel rail pressure control system for pressure that is inappropriately high or inappropriately low.

The fuel rail pressure (FRP) sensor is used to measure the fuel pressure in the diesel common rail system. The FRP sensor is the feedback component in a control loop, and informs the Powertrain Control Module (PCM) about the current pressure in the common rail. The PCM controls the desired rail pressure by operating two valves - called fuel metering valve and a pressure control valve. The correctness of the FRP sensor is important since the inaccuracy can lead to an emission disadvantage. Generally, a reduced rail pressure can lead to an increase in soot emissions while reducing engine out NOx emissions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Fuel Rail pressure control is transitioning to metering unit control mode.
- Fuel Rail pressure control is transitioning to pressure control mode or rail pressure control is transitioning to coupled pressure control.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too low for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL SYSTEM LEAK
AIR IN FUEL SYSTEM
FUEL DELIVERY SYSTEM
FUEL QUANTITY SOLENOID
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are there any other DTCs present?

Yes

- Repair the other DTCs before continuing.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK THE FUEL DELIVERY SYSTEM

1. Go to Non-DTC Diagnosis/Drivability-Diesel and perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. FUEL SYSTEM CONTAMINATION

NOTE: **Mixing any other fuels such as gasoline or kerosine can cause this DTC to set.**

NOTE: **If ambient temperatures have been well below freezing for an extended period of time in the area where the was operated the fuel may have gelled and caused this DTC to set.**

1. Inspect the fuel system for contamination.

Is the fuel contaminated?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0182-00-FUEL TEMPERATURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION P0182_P0183

The fuel system of a diesel engine is incredibly complex and it is necessary to monitor various aspects of its operation to ensure that the system is functioning properly. The Fuel Temperature Sensor (FTS) is combined with the Fuel Heater and located in the Fuel Filter/water separator housing. The Fuel Temperature Sensor is a 2-wire sensor. These codes monitor the FTS circuit for electrical malfunctions.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Fuel Temperature Sensor Signal circuit voltage is below the calibrated threshold for 2 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO THE FUEL TEMPERATURE SENSOR GROUND
FUEL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL TEMPERATURE SENSOR

1. Turn the ignition off.
2. Disconnect the Fuel Temperature Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The scan tool should display the P0183-00 FUEL TEMPERATURE SENSOR CIRCUIT HIGH DTC as active or pending with the connector disconnected.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact in the Fuel Temperature Sensor and Powertrain Control Module connectors. Replace the Fuel Temperature Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE FUEL TEMPERATURE (K156) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between ground and the Fuel Temperature (K156) Signal circuit at the Fuel Temperature Sensor harness connector.

Is there continuity between ground and the Fuel Temperature (K156) Signal circuit?

Yes

- Repair the Fuel Temperature (K156) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL TEMPERATURE SENSOR (K156) SIGNAL CIRCUIT FOR A SHORT TO THE (K159) SENSOR GROUND CIRCUIT

1. Measure the resistance between the Fuel Temperature Sensor (K156) Signal circuit and the (K159) Sensor Ground circuit in the Fuel Temperature Sensor harness connector.

Is there continuity between ground and the?

Yes

- Go To [5](#)

No

- Repair the Fuel Temperature Sensor (K156) Signal circuit for a short to the (K159) Sensor Ground circuit.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0183-00-FUEL TEMPERATURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION P0182_P0183

The fuel system of a diesel engine is incredibly complex and it is necessary to monitor various aspects of its operation to ensure that the system is functioning properly. The Fuel Temperature Sensor (FTS) is combined with the Fuel Heater and located in the Fuel Filter/water separator housing. The Fuel Temperature Sensor is a 2-wire sensor. These codes monitor the FTS circuit for electrical malfunctions.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Fuel Temperature Sensor Signal circuit voltage is above the calibrated threshold for a calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
FUEL TEMPERATURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
FUEL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUEL TEMPERATURE SENSOR (K156) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Fuel Temperature Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Fuel Temperature Sensor (K156) Signal circuit in the Fuel Temperature Sensor harness connector.

Does the voltage measure above 5.2 volts?

Yes

- Repair the Fuel Temperature Sensor (K156) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE FUEL TEMPERATURE SENSOR (K156) SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Fuel Temperature Sensor (K156) Signal circuit between the Fuel Temperature Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Fuel Temperature Sensor (K156) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE (K159) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K159) Sensor Ground circuit between the Fuel Temperature Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K159) Sensor Ground circuit for an open or high resistance.

- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL TEMPERATURE SENSOR

1. Turn the ignition off.
2. Reconnect the Fuel Temperature Sensor harness connector.
3. Reconnect the PCM C1 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Turn the ignition off.
7. Disconnect the Fuel Temperature Sensor harness connector.
8. Connect a jumper wire between the (K159) Sensor Ground circuit and the Fuel Temperature Sensor (K156) Signal circuit in the Fuel Temperature Sensor harness connector.
9. Turn the ignition on.
10. With the scan tool, read DTCs.

NOTE: The scan tool should display a P0182-Fuel Temperature Sensor Low DTC as active with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Fuel Temperature Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0191-00-FUEL RAIL PRESSURE SENSOR "A" CIRCUIT PERFORMANCE

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The tests used to diagnose the closed loop fuel rail pressure control system for pressure that is inappropriately high or inappropriately low.

The fuel rail pressure (FRP) sensor is used to measure the fuel pressure in the diesel common rail system. The FRP sensor is the feedback component in a control loop, and informs the Powertrain Control Module (PCM) about the current pressure in the common rail. The PCM controls the desired rail pressure by operating two valves - called fuel metering valve and a pressure control valve. The correctness of the FRP sensor is important since the inaccuracy can lead to an emission disadvantage. Generally, a reduced rail pressure can lead to an increase in soot emissions while reducing engine out NOx emissions.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- With the ignition on.
- ASD Relay is commanded on.
- No active Fuel Rail Pressure circuit faults.
- Vehicle is in Fuel Delivery mode of operation.
- Engine speed is greater than 300 rpm.

SET CONDITION

- If the PCM does not see a pressure change in the Fuel Rail Pressure Sensor signal of more than 7.0 kPa (1.0 psi).

DEFAULT ACTION

- ETC light will illuminate.
- Throttle input and vehicle speed are limited.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PLUGGED FUEL SYSTEM
FUEL SYSTEM CONTAMINATION
FUEL RAIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0192, P0193 or any 5-Volt supply codes set as active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Check the Fuel System for contamination. Refer to - Fuel System-Fuel Delivery-Standard Procedure-DIESEL FUEL SYSTEM CONTAMINATION. Refer to **FUEL SYSTEM** .

Is there any evidence of contamination?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. RECHECK THE FUEL SYSTEM FOR PROPER IN-TANK FUEL LIFT PUMP FLOW

1. Perform the following to purge air from the system:
 - With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the Valve.
 - Turn the ignition off.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
2. Perform the following three times to find the average flow rate:
 - With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the valve.
 - Turn the ignition off.
 - Measure and record the amount of fuel in the Reservoir Assembly.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
3. Add the three recorded measurements and then divide the total by three to calculate the average flow rate.

NOTE: **The flow rate specification is 750 ml in 15 seconds.**

Does the average flow rate meet or exceed the specification?

Yes

- Go To [5](#)

No

- Replace the Fuel Filter and retest flow rate.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL RAIL PRESSURE SENSOR

1. Disconnect the Fuel Rail Pressure Sensor harness connector.
2. With the scan tool, read DTCs.

NOTE: **The scan tool should display a P0193-FUEL RAIL PRESSURE SENSOR HIGH DTC as active with the connector disconnected.**

Does the scan tool display as described above?

Yes

- Replace the Fuel Rail Pressure Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.

2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0192-00-FUEL RAIL PRESSURE SENSOR LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The tests used to diagnose the closed loop fuel rail pressure control system for pressure that is inappropriately high or inappropriately low.

The fuel rail pressure (FRP) sensor is used to measure the fuel pressure in the diesel common rail system. The FRP sensor is the feedback component in a control loop, and informs the Powertrain Control Module (PCM)

about the current pressure in the common rail. The PCM controls the desired rail pressure by operating two valves - called fuel metering valve and a pressure control valve. The correctness of the FRP sensor is important since the inaccuracy can lead to an emission disadvantage. Generally, a reduced rail pressure can lead to an increase in soot emissions while reducing engine out NOx emissions.

WHEN MONITORED

This diagnostic runs continuously when the following condition are met:

- With the ignition on.

SET CONDITION

- The Fuel Rail Pressure Sensor Signal circuit voltage is below the calibrated threshold for 0.14 second.

DEFAULT ACTION

- ETC light will illuminate.
- Throttle input and vehicle speed are limited.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO THE FUEL RAIL PRESSURE SENSOR GROUND
FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE FUEL PRESSURE SENSOR GROUND
FUEL RAIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: If there are any 5-Volt Supply DTCs present, perform the diagnostics for those DTCs before continuing with this test procedure.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUEL RAIL PRESSURE SENSOR (K181) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Fuel Rail Pressure Sensor harness connector.
3. Disconnect the PCM C2 harness connector.
4. Check for continuity between ground and the Fuel Rail Pressure Sensor (K181) Signal circuit at the Fuel Rail Pressure Sensor harness connector.

Is there continuity between ground and the Fuel Rail Pressure (K181) Signal circuit?

Yes

- Repair the Fuel Rail Pressure (K181) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK FOR THE FUEL RAIL PRESSURE SENSOR (K181) SIGNAL CIRCUIT SHORTED TO THE (K359) SENSOR GROUND CIRCUIT

1. Check for continuity between the Fuel Rail Pressure (K181) Signal circuit and the (K359) Sensor Ground circuit at the Fuel Rail Pressure Sensor harness connector.

Is there continuity between the Fuel Rail Pressure (K181) Signal circuit and the (K359) Sensor Ground circuit?

Yes

- Repair the short between the Fuel Rail Pressure (K181) Signal circuit and the (K359) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL RAIL PRESSURE (K181) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Fuel Rail Pressure (K181) Signal circuit between the Fuel Rail Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Fuel Rail Pressure (K181) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. FUEL RAIL PRESSURE SENSOR

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between the Fuel Rail Pressure Sensor (K181) Signal circuit and the (K350) 5-Volt Supply circuit at the Fuel Rail Pressure Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The P0193-00 FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT HIGH DTC should be active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact at the sensor and Powertrain Control Module connectors. Replace the Fuel Rail Pressure Sensor in accordance with the Service Information if no problems were found in the connector.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs and record on the repair order.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0193-00-FUEL RAIL PRESSURE SENSOR HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The tests used to diagnose the closed loop fuel rail pressure control system for pressure that is inappropriately high or inappropriately low.

The fuel rail pressure (FRP) sensor is used to measure the fuel pressure in the diesel common rail system. The FRP sensor is the feedback component in a control loop, and informs the Powertrain Control Module (PCM) about the current pressure in the common rail. The PCM controls the desired rail pressure by operating two valves - called fuel metering valve and a pressure control valve. The correctness of the FRP sensor is important since the inaccuracy can lead to an emission disadvantage. Generally, a reduced rail pressure can lead to an increase in soot emissions while reducing engine out NOx emissions.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Fuel Rail Pressure Sensor Signal circuit voltage is above the calibrated threshold for a calibrated period of time.

DEFAULT ACTION

- ETC light will illuminate.
- Throttle input and vehicle speed are limited.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Possible Causes
FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
FUEL RAIL PRESSURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
FUEL RAIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
FUEL RAIL PRESSURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
FUEL RAIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE FUEL PRESSURE SENSOR (K181) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Fuel Rail Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Fuel Rail Pressure (K181)Sensor Signal circuit in the Fuel Rail Pressure Sensor harness connector.

Does the voltage measure above 5.2 volts?

Yes

- Repair the Fuel Rail Pressure (K181)Sensor Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE FUEL PRESSURE SENSOR (K181) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the Fuel Rail Pressure (K181) Sensor Signal circuit between the Fuel Rail Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Fuel Rail Pressure (K181) Sensor Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (K359) FUEL PRESSURE SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Fuel Rail Pressure (K359) Sensor Ground circuit between the Fuel Rail Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K359) Fuel Rail Pressure Sensor Ground circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK FOR THE FUEL RAIL PRESSURE (K181) SIGNAL CIRCUIT SHORTED TO THE (K350) 5-VOLT SUPPLY CIRCUIT

1. Check for continuity between the Fuel Rail Pressure (K181) Sensor Signal circuit and the (K350) 5-Volt Supply circuit at the Fuel Rail Pressure Sensor harness connector.

Is there continuity between the Fuel Rail Pressure (K181) Sensor Signal circuit and the (K350) 5-Volt Supply circuit?

Yes

- Repair the short between the Fuel Rail Pressure (K181) Signal circuit and the (K350) 5-Volt Supply circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE ABILITY OF THE PCM TO MONITOR THE FUEL RAIL PRESSURE SENSOR

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between the (K350) Fuel Rail Pressure Signal circuit and the (K359) Sensor Ground circuit at the Fuel Rail Pressure Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The P0192-00 FUEL RAIL PRESSURE SENSOR SIGNAL CIRCUIT LOW DTC should be active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact in the Sensor and Powertrain Control Module connectors. Replace the Fuel Rail Pressure Sensor if no problems were found in the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

NOTE: Remove the jumper before continuing.

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0196-00-ENGINE OIL TEMPERATURE SENSOR PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

Once the Ambient Air Temperature (AAT), Intake Air Temperature (IAT), and Engine Coolant Temperature (ECT) Sensors have been evaluated the Engine Oil Temperature (EOT) Sensor can be checked. If the ambient, engine coolant, and general temperature sensor rationalities indicate valid sensor readings then the engine oil temperature rationality will assume the AAT and ECT Sensors are correct and therefore can be used to evaluate the EOT Sensor.

To determine failing status, the difference between the starting EOT and starting ECT is compared to a threshold. If the calculated difference is above the threshold, then starting EOT is compared to starting AAT. The diagnostic will check to see if a block heater is being used to determine if larger threshold values are needed. If this rationality test fails, then it is tested again using the updated value of AAT. A failure here will result in a fault being set for EOT sensor.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM has detected that the difference between the EOT and other temperature sensors is beyond a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
EOT SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND OPEN/HIGH RESISTANCE
ENGINE OIL TEMPERATURE (EOT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC STANDARD PROCEDURE**.

2. ISOLATE AND CHECK THE ENGINE OIL TEMPERATURE (EOT) SENSOR (G224) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. ISOLATE AND CHECK THE (G924) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. REPLACE THE ENGINE OIL PRESSURE (EOP) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0197-00-ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

Once the Ambient Air Temperature (AAT), Intake Air Temperature (IAT), and Engine Coolant Temperature (ECT) Sensors have been evaluated the Engine Oil Temperature (EOT) Sensor can be checked. If the ambient, engine coolant, and general temperature sensor rationalities indicate valid sensor readings then the engine oil temperature rationality will assume the AAT and ECT Sensors are correct and therefore can be used to evaluate the EOT Sensor.

To determine failing status, the difference between the starting EOT and starting ECT is compared to a threshold. If the calculated difference is above the threshold, then starting EOT is compared to starting AAT. The diagnostic will check to see if a block heater is being used to determine if larger threshold values are needed. If this rationality test fails, then it is tested again using the updated value of AAT. A failure here will result in a fault being set for EOT sensor.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- No supply voltage or internal module error, DTCs set.

SET CONDITION

- The EOT Signal circuit voltage is below a calibrated threshold for calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EOT SIGNAL CIRCUIT SHORTED TO GROUND
EOT SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
ENGINE OIL TEMPERATURE (EOT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

2. CHECK THE ABILITY OF THE PCM TO MONITOR THE ENGINE OIL TEMPERATURE SENSOR SIGNAL

1. Turn the ignition off.
2. Disconnect the EOT Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs.

NOTE: The scan tool should display the **P0198-00 ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH DTC** as active or pending with the connector disconnected.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact in the EOT Sensor and Powertrain Control Module C2 connectors. Replace the Engine Oil Temperature Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE EOT SENSOR (G224) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Check for continuity between ground and the EOT Sensor (G224) Signal circuit at the EOT Sensor harness connector.

Is there continuity between ground and the EOT Sensor (G224) Signal circuit?

Yes

- Repair the EOT Sensor (G224) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR THE EOT SENSOR (G224) SIGNAL CIRCUIT SHORTED TO THE (G924) GROUND CIRCUIT

1. Check for continuity between the EOT Sensor (G224) Signal circuit and the (G924) Sensor Ground circuit at the EOT Sensor harness connector.

Is there continuity between the EOT Sensor (G224) Signal circuit and the (G924) Sensor Ground circuit?

Yes

- Repair the short between the EOT Sensor (G224) Signal circuit and the (G924) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0198-00-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

Once the Ambient Air Temperature (AAT), Intake Air Temperature (IAT), and Engine Coolant Temperature (ECT) Sensors have been evaluated the Engine Oil Temperature (EOT) Sensor can be checked. If the ambient, engine coolant, and general temperature sensor rationalities indicate valid sensor readings then the engine oil temperature rationality will assume the AAT and ECT Sensors are correct and therefore can be used to evaluate the EOT Sensor.

To determine failing status, the difference between the starting EOT and starting ECT is compared to a threshold. If the calculated difference is above the threshold, then starting EOT is compared to starting AAT. The diagnostic will check to see if a block heater is being used to determine if larger threshold values are needed. If this rationality test fails, then it is tested again using the updated value of AAT. A failure here will result in a fault being set for EOT sensor.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- No supply voltage or internal module error, DTCs set.

SET CONDITION

- The Engine Oil Temperature (EOT) Signal circuit voltage is above a calibrated threshold for calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE OIL TEMPERATURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
ENGINE OIL TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ENGINE OIL TEMPERATURE (EOT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EOT (G224) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EOT Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the EOT (G224) Signal circuit at the EOT Sensor harness connector.

Is the voltage above 5.6 volts?

Yes

- Repair the Engine Oil Temperature (G224) Signal circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EOT (G224) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the EOT (G224) Signal circuit between the EOT Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Engine Oil Temperature (G224) Signal circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE EOT (G924) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (G924) Sensor Ground circuit between the EOT Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (G924) Sensor Ground circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE ENGINE OIL TEMPERATURE SENSOR SIGNAL CIRCUIT

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between the EOT Signal Sensor (G224) Signal circuit and the (G924) Sensor Ground at the EOT Sensor harness connector

NOTE: **The P0197-00 ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW DTC should be active or pending with the jumper in place.**

3. Turn the ignition on.
4. With the scan tool, read DTCS.

Does the scan tool display as described above?

Yes

- Replace the Engine Oil Temperature Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.

2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P01C4-00-FUEL PRESSURE SENSOR A CIRCUIT RANGE-PERFORMANCE

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module detects the Low Fuel Pressure Sensor reading has drifted outside of the calibrated range.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LOW FUEL PRESSURE SENSOR SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
LOW FUEL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE LOW FUEL PRESSURE (F856) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE LOW FUEL PRESSURE (K179) PRESSURE SIGNAL 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE LOW FUEL PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.

3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P01C5-00-FUEL PRESSURE SENSOR A CIRCUIT LOW

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module detects the Low Fuel Pressure Sensor reading has drifted below a calibrated range.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LOW FUEL PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO GROUND LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND LOW FUEL PRESSURE SENSOR POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE LOW FUEL PRESSURE SENSOR (K179) PRESSURE SIGNAL 2 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LOW FUEL PRESSURE SENSOR (F856) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE LOW FUEL PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P01C6-00-FUEL PRESSURE SENSOR A CIRCUIT HIGH

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module detects the Low Fuel Pressure Sensor reading has drifted above a calibrated range.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
LOW FUEL PRESSURE SENSOR SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
LOW FUEL PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
LOW FUEL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Reference DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE (F856) 5-VOLT SUPPLY CIRCUIT FOR PROPER VOLTAGE AT THE FUEL PRESSURE SENSOR HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** The ECU harness connector should still be connected during this test step.
3. Turn the ignition on.
4. Set the DVOM to measure DC voltage.
5. Connect the negative lead of the DVOM to a known good ground.
6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: Normal operating voltage should be between 4.8 and 5.2 volts.

Does the circuit have the proper voltage present?

Yes

- Go To [4](#)

No

- Repair the (F856) 5-Volt Supply circuit for an open or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL PRESSURE SENSOR (K179) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: The voltage on a 5.0 volt signal or reference circuit should be between approximately 4.8 and 5.2 volts.

Is the voltage above 5.2 volts?

Yes

- Go To [5](#)

No

- Go To [6](#)

5. ISOLATE AND CHECK THE FUEL PRESSURE SENSOR (K179) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

6. ISOLATE AND CHECK THE FUEL PRESSURE SENSOR (K179) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE (K916) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CONNECT A FUSED JUMPER BETWEEN THE FUEL PRESSURE SENSOR (K179) PRESSURE SIGNAL CIRCUIT AND THE (K916) SENSOR GROUND CIRCUIT AT THE FUEL PRESSURE SENSOR HARNESS CONNECTOR - VERIFY ABILITY OF THE PCM TO DETECT THE SENSOR SIGNAL CIRCUIT LOW DTC

1. The Electronic Control Module (ECU) harness connectors must be connected to the ECU during this test step.
2. Disconnect the sensor harness connector.
3. With the ignition in the off position, connect a fused jumper between the sensor signal circuit and the sensor ground circuit at the sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Does the scan tool display the SENSOR SIGNAL CIRCUIT LOW DTC with the jumper in place?

Yes

- Replace the faulty sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P01CB-00-CYLINDER 1 INJECTION TIMING PERFORMANCE - OVER RETARDED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCS active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P01CC-00-CYLINDER 1 INJECTION TIMING PERFORMANCE - OVER ADVANCED

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [**4**](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P01CD-00-CYLINDER 2 INJECTION TIMING PERFORMANCE - OVER RETARDED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed.

Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P01CE-00-CYLINDER 2 INJECTION TIMING PERFORMANCE - OVER ADVANCED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can

vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCS active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P01CF-00-CYLINDER 3 INJECTION TIMING PERFORMANCE - OVER RETARDED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCS active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P01D0-00-CYLINDER 3 INJECTION TIMING PERFORMANCE - OVER ADVANCED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P01D1-00-CYLINDER 4 INJECTION TIMING PERFORMANCE - OVER RETARDED

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P01D2-00-CYLINDER 4 INJECTION TIMING PERFORMANCE - OVER ADVANCED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Selective Catalytic Reduction (SCR) temperature is between 250 B°C (482 B°F) and 400 B°C (752 B°F) and Extended overrun.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the learned fuel quantities are below the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.
- This is a 2 trip fault.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR CALIBRATION (ZERO FUEL CALIBRATION)
CHARGE AIR COOLER (CAC) LEAK
FUEL INJECTOR IMPROPERLY INSTALLED

Possible Causes
CONTAMINATED FUEL
FUEL INJECTOR (STICKING OPEN)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. Refer to the recorded DTCs.

Are there any Air Handling Systems, Cam/Cranks, Fuel Systems, or Misfire detection DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [2](#)

2. CHECK FOR CAC FOR LEAKS

1. Visually inspect the Charge Air Cooler (CAC) and plumbing for cracks, holes, loose clamps, or damage. Inspect the tubes, fins, and welds for tears, breaks, or other damage

Where any faulty conditions found?

Yes

- Perform the applicable repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. INSPECT THE FUEL INJECTOR

1. Turn the ignition off.
2. Inspect the fuel injector for proper installation in accordance with the Service Information.
3. Check the injector hold down for proper torque.

Was the fuel injector properly installed and securely fastened??

Yes

- Go To [4](#)

No

- If the hold down is loose, remove and inspect fuel injector. Replace the fuel injector if it is damaged. Install the fuel injector in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. INSPECT FUEL FOR CONTAMINATION

1. Inspect fuel for contamination. Refer to [FUEL SYSTEM](#) .

Was a problem found in the fuel?

Yes

- Perform the applicable repair using the Service Information. After the repair is completed road test the vehicle at speeds of 88 kph (55 mph) or greater for 30 minutes to confirm the repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CLEAN THE FUEL INJECTOR AND RESET THE FUEL INJECTOR CALIBRATION

1. If available, clean the fuel injectors in accordance with the service information.
2. Using the scan tool perform the Zero Fuel Quantity Calibration for the effected Fuel Injector.
3. Using the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Briefly Road test the vehicle at speeds of 88 kph (55 mph) or greater for 30 minutes. During the road test coast-downs must be performed to cycle the injector under varying loads.

NOTE: Coast-downs consist of removing all pressure from the accelerator pedal for 10 to 15 seconds while driving. Coast-down events must be 30-60 seconds apart with normal driving between coast-down events. Accelerate to a steady 55 mph for approximately 30-60 seconds. Repeat for a total of 20-25 times

Does the MIL return during road test?

Yes, there is a new DTC.

- Perform the applicable repair using the Service Information. After the repair is completed road test the vehicle at speeds of 88 kph (55 mph) or greater for ten minutes to confirm the repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

Yes, DTC is still Active or Pending.

- Go To [6](#)

No

- The vehicle has been repaired,
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. REPLACE THE FUEL INJECTOR

1. Turn the ignition off.
2. Replace the Fuel injector in accordance with the Service Information.
3. Connect all disconnected harness connectors.

4. Turn the ignition on.
5. Perform the zero fuel calibration in the scan tool.
6. With the scan tool, erase all DTCs.
7. Turn the ignition off for a minimum of 75.0 seconds.
8. Turn the ignition on.
9. Briefly Road test the vehicle at speeds of 88 kph (55 mph) or greater for ten minutes. During the road test coast-downs must be performed to cycle the injector under varying loads.

NOTE: **Coast-downs consist of removing all pressure from the accelerator pedal for 10 to 15 seconds while driving. Coast-down events must be 30-60 seconds apart with normal driving between coast-down events. Accelerate to a steady 55 mph for approximately 30-60 seconds. Repeat for a total of 20-25 times**

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the faulty Fuel Injector repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P01D3-00-CYLINDER 5 INJECTION TIMING PERFORMANCE - OVER RETARDED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P01D4-00-CYLINDER 5 INJECTION TIMING PERFORMANCE - OVER ADVANCED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P01D5-00-CYLINDER 6 INJECTION TIMING PERFORMANCE - OVER RETARDED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To [4](#)

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P01D6-00-CYLINDER 6 INJECTION TIMING PERFORMANCE - OVER ADVANCED

THEORY OF OPERATION

The fuel injectors spray a calibrated amount of fuel when energized. When the fuel injectors are new, this value is learned in the Powertrain Control Module (PCM). Over time, as fuel injectors age, the amount of fuel can vary (increase or decrease). The PCM will adjust the energizing time of the fuel injectors as needed to compensate for the drift in the fuel injector spray volume. There is a maximum amount of variance allowed for each fuel injector. The PCM monitors the amount of correction to the energizing time for each fuel injector. The energizing time is calculated during Decel Fuel Shut-Off (DFSO). The fuel injectors are monitored individually by energizing a single fuel injector during DFSO and monitoring for a calculated increase in engine speed. Based on this, the PCM will adjust the energizing time as needed. The PCM will fail a fuel injector if the energizing time exceeds the calibrated limit for a given fuel injector. This is performed for each fuel injector. While one injector is monitored at a time, multiple injectors may be monitored during a single DFSO.

It is possible for an engine issue such as contaminated fuel or a small leak in the intake air system can to cause a fuel injector calibration fault before other fuel or intake handling diagnostics will exceed a calibrated threshold and set a DTC.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that inaccurate fuel injection has occurred.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MECHANICAL FAILURE
FUEL INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR System, Crankshaft Position, or Camshaft Position DTCs active or pending?

Yes

- Repair as necessary in accordance with the Service Information. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To **3**

3. CHECKING ENGINE FOR A KNOCK

1. Start the engine and allow it to idle for one minute.
2. Operate the engine under conditions in which the complaint occur.
3. Listen for an engine knock.

Is there a knock present?

Yes

- Go To **4**

No

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE FUEL INJECTOR FOR A LEAK

1. Continue to run the engine at idle.
2. Using the scan tool, perform the Injector Kill Test for the cylinder in question.

Does the knock go away?

Yes

- Replace the Fuel Injector in accordance with the Service Information. If this DTC was accompanied by a Crankcase Pressure Sensor DTC, damage to the cylinder may have occurred.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Diagnose the engine for a mechanical failure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0201-00-FUEL INJECTOR 1 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open Fuel Injector 1 control circuit.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 1 HIGH SIDE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL INJECTOR 1 LOW SIDE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

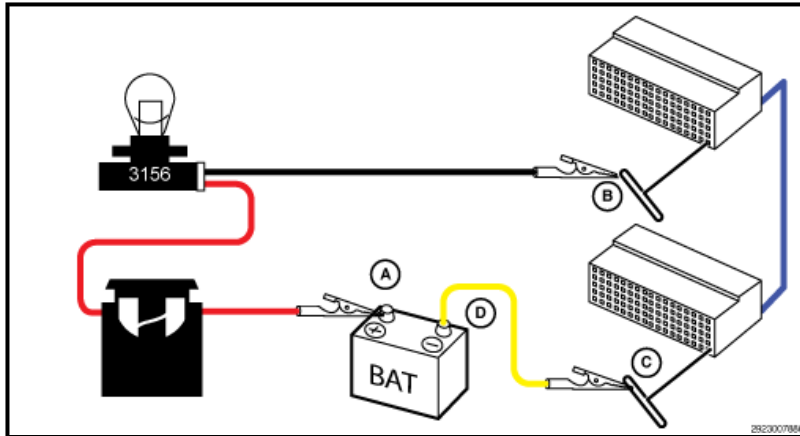
2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 1 (K227) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 1 and Fuel Injector 3 harness connectors.
3. Disconnect the PCM C2 harness connector.

4. Load test the Fuel Injector 1 (K227) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

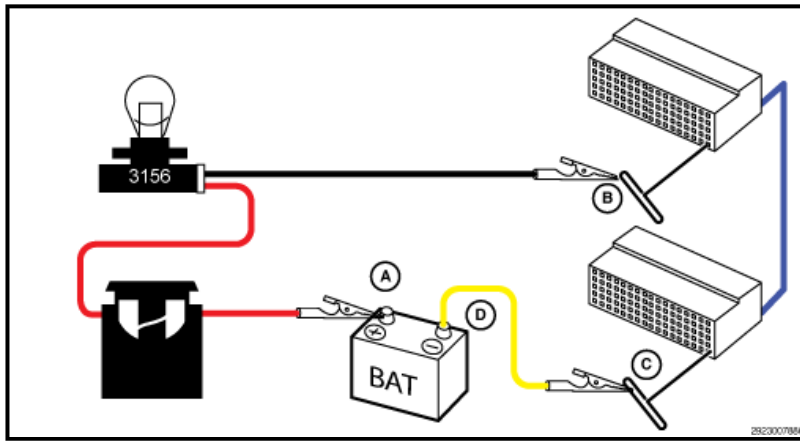
- Repair the Fuel Injector 1 (K227) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 1 (K611) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the Fuel Injector 1 (K611) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fuel Injector 1 (K611) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR 1 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 1.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0202-00-FUEL INJECTOR 2 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open Fuel Injector 2 control circuit.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 2 HIGH SIDE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL INJECTOR 2 LOW SIDE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

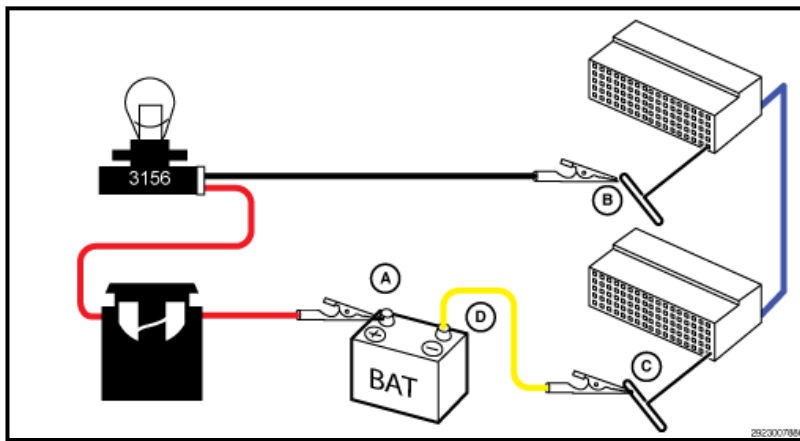
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 2 (K12) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 2 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Load test the Fuel Injector 2 (K12) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

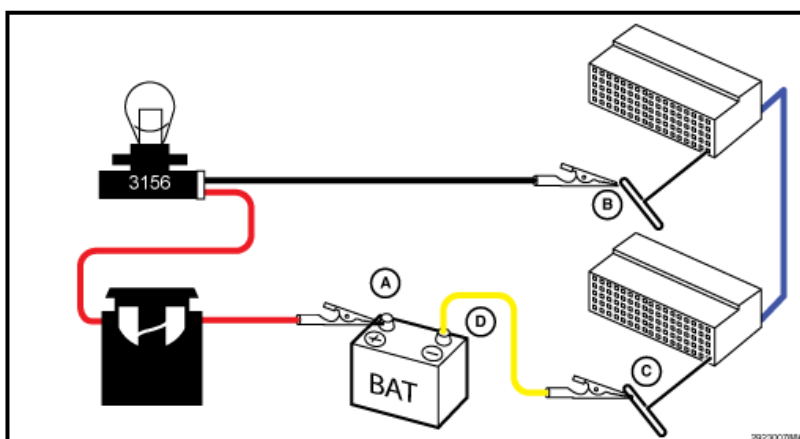
- Repair the Fuel Injector 2 (K12) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 2 (K612) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test The Fuel Injector 2 (K612) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair The Fuel Injector 2 (K612) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR 2 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 2.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0203-00-FUEL INJECTOR 3 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open Fuel Injector 3 control circuit.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

POSSIBLE CAUSES
FUEL INJECTOR 3 HIGH SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3 LOW SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

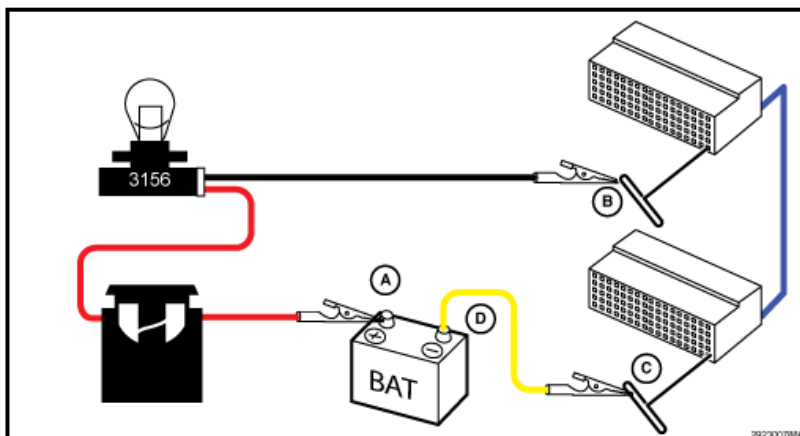
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 3 (K227) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 1 and Fuel Injector 3 harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Load test the Fuel Injector 3 (K227) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the

bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

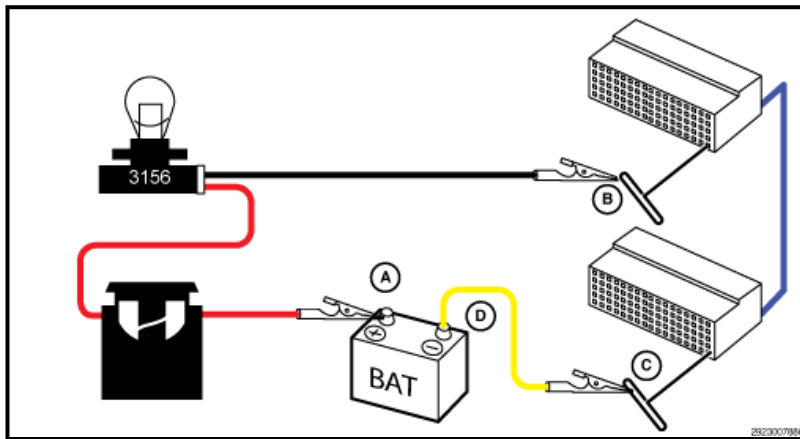
- Repair the Fuel Injector 3 (K227) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 3 (K613) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the Fuel Injector 3 (K613) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fuel Injector 3 (K613) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR 3 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 3.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0204-00-FUEL INJECTOR 4 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

Set Conditions:

- The Powertrain Control Module (PCM) detects an open Fuel Injector 4 control circuit.

Default Actions:

- ETC light will illuminate.
- The MIL will illuminate.

WHEN MONITORED

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 4 HIGH SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 4 LOW SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

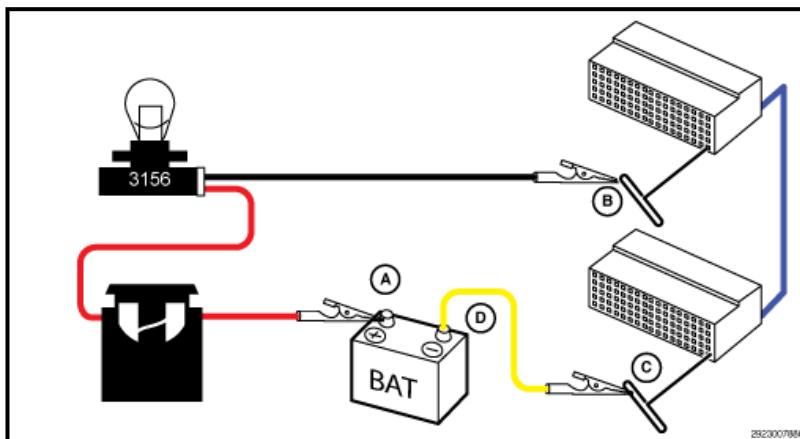
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 4 (K229) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 4 and Fuel Injector 6 harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Load test the Fuel Injector 4 (K229) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

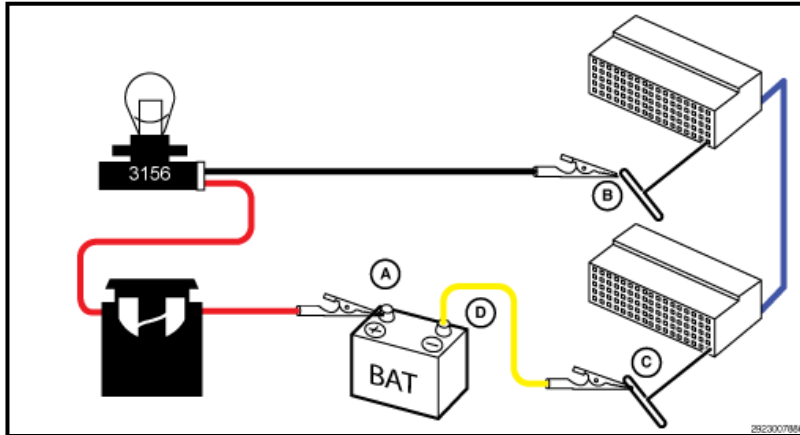
- Repair the Fuel Injector 4 (K229) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 4 (K614) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the Fuel Injector 4 (K614) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fuel Injector 4 (K614) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE FUEL INJECTOR 4 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 4.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0205-00-FUEL INJECTOR 5 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open Fuel Injector 5 control circuit.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 5 HIGH SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 5 LOW SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 5 (K38) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

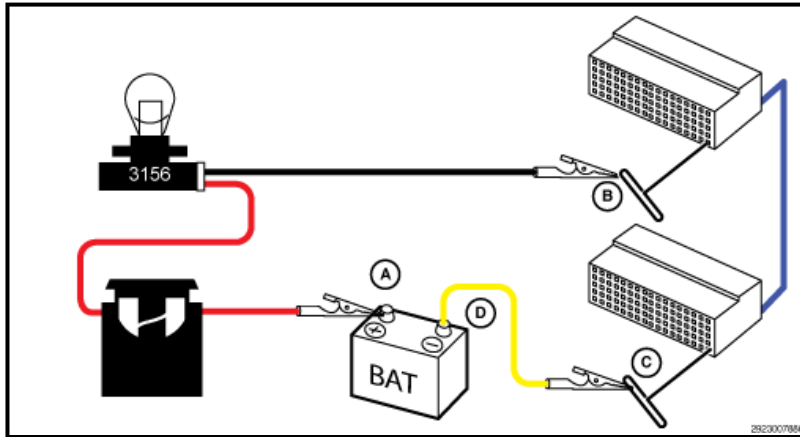
NOTE:

Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION:

Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 5 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Load test the Fuel Injector 5 (K38) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

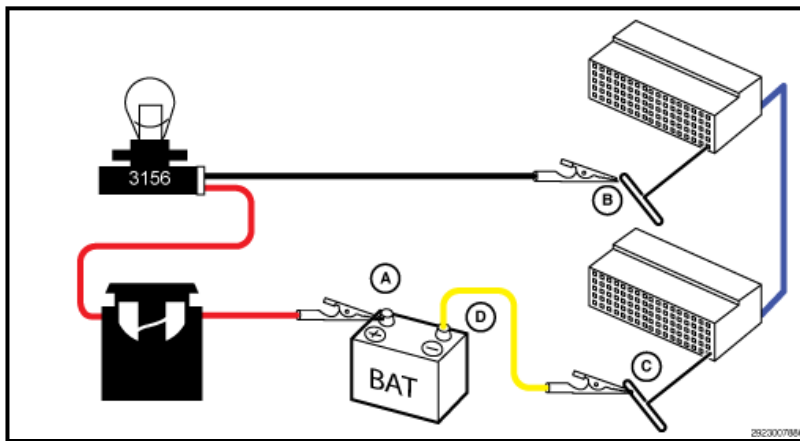
- Repair the Fuel Injector 5 (K38) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 5 (K638) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the Fuel Injector 5 (K638) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fuel Injector 5 (K638) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR 5 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 5.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0206-00-FUEL INJECTOR 6 CIRCUIT OPEN

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open Fuel Injector 6 control circuit.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 6 HIGH SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR 6 LOW SIDE CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

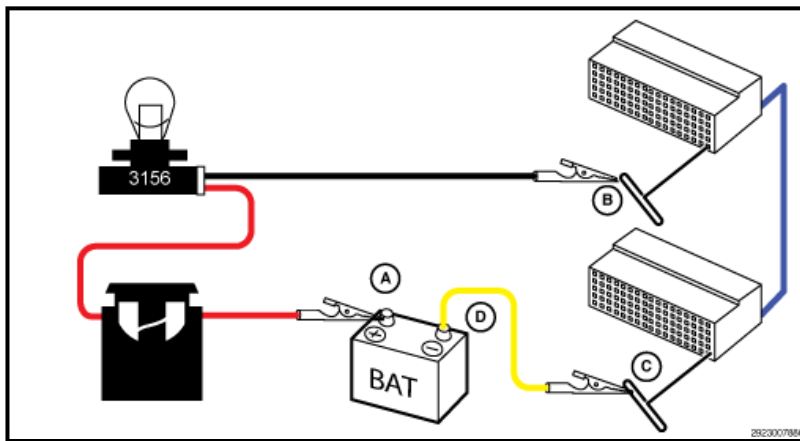
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND LOAD TEST THE FUEL INJECTOR 6 (K229) HIGH SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Fuel Injector 4 and Fuel Injector 6 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Load test the Fuel Injector 6 (K229) High Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

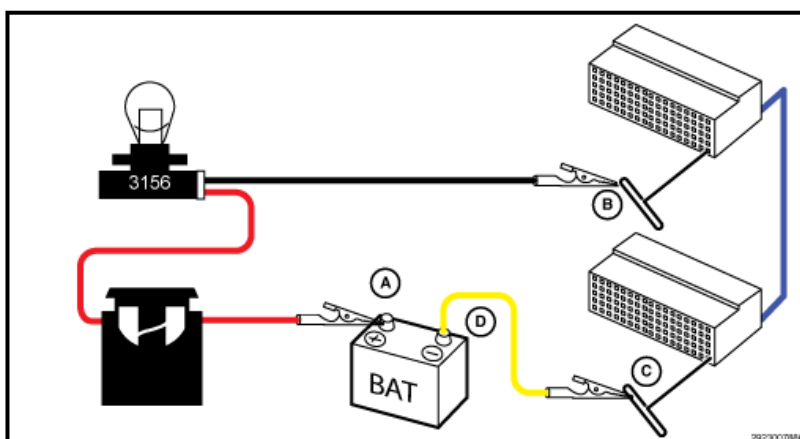
- Repair the Fuel Injector 6 (K229) High Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND LOAD TEST THE FUEL INJECTOR 6 (K658) LOW SIDE CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the Fuel Injector 6 (K658) Low Side Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the Fuel Injector 6 (K658) Low Side Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE FUEL INJECTOR 6 FOR EXCESSIVE RESISTANCE

1. Measure the resistance between the terminals of Fuel Injector 6.

NOTE: Be sure to zero the meter before taking the measurement. A good Fuel Injector has approximately 0.5 Ohm of resistance when measured through it.

Is the resistance below 1.0 Ohm?

Yes

- Go To [5](#)

No

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P020A-00-CYLINDER 1 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Selective Catalytic Reduction (SCR) temperature is between 250 B°C (482 B°F) and 400 B°C (752 B°F) and Extended overrun.
- Injector timing is in steady state with the engine driving and below 4000 RPM.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.
- This is a 2 trip fault.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 1 CALIBRATION (ZERO FUEL CALIBRATION)
CHARGE AIR COOLER (CAC) LEAK
FUEL INJECTOR IMPROPERLY INSTALLED
CONTAMINATED FUEL
FUEL INJECTOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Air Handling Systems, Cam/Cranks, Fuel Systems, or Misfire detection DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR CAC FOR LEAKS

1. Visually inspect the Charge Air Cooler (CAC) and plumbing for cracks, holes, loose clamps, or damage. Inspect the tubes, fins, and welds for tears, breaks, or other damage

Where any faulty conditions found?

Yes

- Perform the applicable repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. INSPECT THE FUEL INJECTOR

1. Turn the ignition off.
2. Inspect the fuel injector for proper installation in accordance with the Service Information.
3. Check the injector hold down for proper torque.

Was the fuel injector properly installed and securely fastened??

Yes

- Go To [5](#)

No

- If the hold down is loose, remove and inspect fuel injector. Replace the fuel injector if it is damaged. Install the fuel injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. INSPECT FUEL FOR CONTAMINATION

1. Inspect fuel for contamination. Refer to [FUEL SYSTEM](#).

Was a problem found in the fuel?

Yes

- Perform the applicable repair using the Service Information. After the repair is completed road test the vehicle at speeds of 88 kph (55 mph) or greater for 30 minutes to confirm the repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. RESET THE FUEL INJECTOR CALIBRATION

1. Using the scan tool perform the Zero Fuel Quantity Calibration for the effected Fuel Injector.
2. Using the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 75.0 seconds.
4. Briefly Road test the vehicle at speeds of 88 kph (55 mph) or greater for 30 minutes. During the road test coast-downs must be performed to cycle the injector under varying loads.

NOTE: Coast-downs consist of removing all pressure from the accelerator pedal for 10 to 15 seconds while driving. Coast-down events must be 30-60 seconds apart with normal driving between coast-down events. Accelerate to a steady 55 mph for approximately 30-60 seconds. Repeat for a total of 20-25 times

Does the MIL return during road test?

Yes, there is a new DTC.

- Perform the applicable repair using the Service Information. After the repair is completed road test the vehicle at speeds of 88 kph (55 mph) or greater for ten minutes to confirm the repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No, P020A-00 is still Active or Pending.

- Go To [7](#)

No

- The vehicle has been repaired,
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. REPLACE THE FUEL INJECTOR

1. Turn the ignition off.
2. Replace the Fuel injector in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. Perform the zero fuel calibration in the scan tool.
6. With the scan tool, erase all DTCs.
7. Turn the ignition off for a minimum of 75.0 seconds.
8. Turn the ignition on.
9. Briefly Road test the vehicle at speeds of 88 kph (55 mph) or greater for ten minutes. During the road test coast-downs must be performed to cycle the injector under varying loads.

NOTE: Coast-downs consist of removing all pressure from the accelerator pedal for 10 to 15 seconds while driving. Coast-down events must be 30-60 seconds apart with normal driving between coast-down events. Accelerate to a steady 55 mph for approximately 30-60 seconds. Repeat for a total of 20-25 times

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty Fuel Injector repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P020B-00-CYLINDER 2 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 2

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P020C-00-CYLINDER 3 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 3

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P020D-00-CYLINDER 4 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 4

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P020E-00-CYLINDER 5 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 5

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P020F-00-CYLINDER 6 INJECTION TIMING

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Fuel Injector closing time exceeds the calibrated limit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR 6

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P0219-00-ENGINE OVERSPEED

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Crank Position Sensor (CKP) indicates engine speed is at or above the calibrated threshold for 0.05 second. NOTE: Engine damage is possible when the engine speed exceeds 4800 RPM.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRANKSHAFT POSITION SENSOR WIRING AND CONNECTORS
CRANKSHAFT POSITION (CKP) SENSOR
DRIVER ERROR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

CHECK THE CRANK SENSOR FOR DAMAGE OR WIRING HARNESS OR CONNECTOR ISSUES

1. Turn the ignition off.
2. Check the CKP Sensor wiring between the Powertrain Control Module (PCM) and CKP Sensor harness connectors for poor terminal contact, corrosion or other problems that may cause erratic CKP Sensor signals.
3. Check the CKP Sensor for damage and proper mounting.

Were there any signs of damage?

Yes

- Repair or replace as necessary. Use the Service Information to check for engine mechanical problems that may have occurred due to excessive engine speed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Test complete.

P0231-00-FUEL PUMP SECONDARY CIRCUIT LOW

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

COMPONENT FUNCTIONAL DESCRIPTION AND DIAGNOSTIC OVERVIEW - FUEL PUMP RELAY

Functional Operation of the Fuel Pump Relay: Depending on the type of relay being used for the Fuel Pump Relay, the approximate resistance of the relay coil should be:

- 72-98 Ohms for a mini relay (larger square relay).
- 94-114 Ohms for a micro relay (smaller rectangular relay).

- 160-225 Ohms for a Printed Circuit Board (PCB) relay.

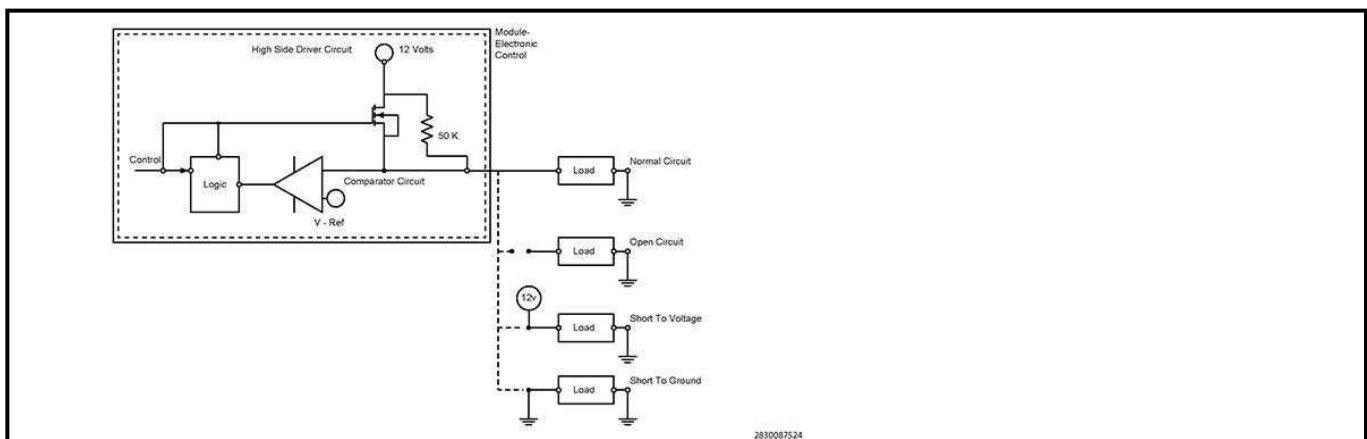
NOTE: The coil resistance of a relay or solenoid can vary based on factors like temperature or age of the component. Typically a 10% variance is allowed on a new component at room temperature. Therefore, do not always assume that a component that is measuring slightly outside of the tolerance given is faulty. A faulty component usually will be noticeably out of tolerance.

Diagnostic Overview: With the ignition on and the PCM energized, battery voltage should be present at the Fuel Pump Relay Control circuit at the PDC.

- Ignition on, but no voltage would indicate a open or short to ground on the Fuel Pump Relay Control Circuit. Lack of voltage may also indicate the PCM High Side Driver (HSD) is not operable, but this is not common.
- Ignition on voltage present would indicate a functioning PCM HSD.

Typical High Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides 12 volts to operate the device when switched on. The voltage could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. The graphic shows how the PCM performs diagnostics using an internal pull up diagnostic resistor and calibrated voltage reference (V-Ref) as a comparator for fault detection.

- **Circuit Open and Circuit High Detection:** The PCM monitors for an **open circuit** and **short to voltage** when the internal driver is switched off. A milliampere voltage is provided to the device through the **internal pull up diagnostic resistor** connected in series with the device. The diagnostic voltage is monitored between the pull up resistor and device, and compared to V-Ref. If the resistance in the device or circuitry becomes too large (approaches open) the voltage supply will increase on the **comparator circuit** and become greater than V-Ref, and a fault is detected. A short to Battery voltage will have the same effect. **An alternative method of fault detection for an open** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open.
- **Circuit Low Detection:** The PCM monitors for a **short to ground** when the driver is turned on. When switched on, the voltage to the device should be close to the 12 volt supply voltage. A short to ground will pull the voltage at the **comparator circuit** below V-Ref and a circuit low fault is detected. **An alternative method of fault detection for a short to ground** that is used is to monitor current draw when the internal driver is switched on. Excessive current draw detected would indicate a short to ground.



WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the ignition on.

- Battery voltage greater than 10.4 volts.
- The ASD Relay is energized.

SET CONDITION

- The PCM detects that the Fuel Pump Relay Control circuit is shorted to ground.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO THE FUEL PUMP RETURN CIRCUIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE FUEL PUMP (N9) RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE FUEL PUMP (N9) RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0232-00-FUEL PUMP SECONDARY CIRCUIT HIGH

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

COMPONENT FUNCTIONAL DESCRIPTION AND DIAGNOSTIC OVERVIEW - FUEL PUMP RELAY

Functional Operation of the Fuel Pump Relay: Depending on the type of relay being used for the Fuel Pump Relay, the approximate resistance of the relay coil should be:

- 72-98 Ohms for a mini relay (larger square relay).
- 94-114 Ohms for a micro relay (smaller rectangular relay).
- 160-225 Ohms for a Printed Circuit Board (PCB) relay.

NOTE:

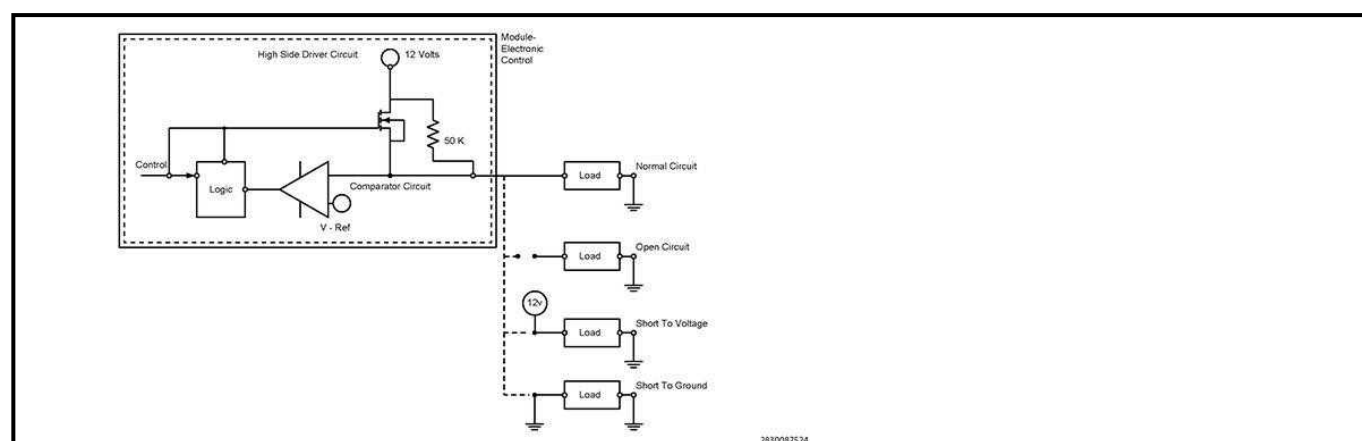
The coil resistance of a relay or solenoid can vary based on factors like temperature or age of the component. Typically a 10% variance is allowed on a new component at room temperature. Therefore, do not always assume that a component that is measuring slightly outside of the tolerance given is faulty. A faulty component usually will be noticeably out of tolerance.

Diagnostic Overview: With the ignition on and the PCM energized, battery voltage should be present at the Fuel Pump Relay Control circuit at the PDC.

- Ignition on, but no voltage would indicate a open or short to ground on the Fuel Pump Relay Control Circuit. Lack of voltage may also indicate the PCM High Side Driver (HSD) is not operable, but this is not common.
- Ignition on voltage present would indicate a functioning PCM HSD.

Typical High Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides 12 volts to operate the device when switched on. The voltage could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. The graphic shows how the PCM performs diagnostics using an internal pull up diagnostic resistor and calibrated voltage reference (V-Ref) as a comparator for fault detection.

- **Circuit Open and Circuit High Detection:** The PCM monitors for an **open circuit** and **short to voltage** when the internal driver is switched off. A milliampere voltage is provided to the device through the **internal pull up diagnostic resistor** connected in series with the device. The diagnostic voltage is monitored between the pull up resistor and device, and compared to V-Ref. If the resistance in the device or circuitry becomes too large (approaches open) the voltage supply will increase on the **comparator circuit** and become greater than V-Ref, and a fault is detected. A short to Battery voltage will have the same effect. **An alternative method of fault detection for an open** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open.
- **Circuit Low Detection:** The PCM monitors for a **short to ground** when the driver is turned on. When switched on, the voltage to the device should be close to the 12 volt supply voltage. A short to ground will pull the voltage at the **comparator circuit** below V-Ref and a circuit low fault is detected. **An alternative method of fault detection for a short to ground** that is used is to monitor current draw when the internal driver is switched on. Excessive current draw detected would indicate a short to ground.



WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10.4 volts.
- The ASD Relay is energized.

SET CONDITION

- The PCM detects a short to voltage on the Fuel Pump Relay Control circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE FUEL PUMP (N9) RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE FUEL PUMP (N9) RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0234-00-TURBOCHARGER OVERBOOST CONDITION

THEORY OF OPERATION

The PCM detects there is an overboost condition when various sensor inputs indicate there should be a specific amount of boost from the Turbocharger during various conditions, but the Boost Pressure Sensor value is above those expectations. There are many possible reasons for this condition (listed in the Possible Causes Table below).

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0234-00 monitor when there is an underboost occurrence during the SHU mode.

The PCM uses the P2D30-00 monitor when there is an underboost occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when underboost is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- The Powertrain Control Module (PCM) attempting to govern Turbocharger boost pressure.

SET CONDITION

- The Boost Pressure Sensor indicates actual Turbocharger boost pressure is greater than the PCM set point for engine boost for five seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PLUGGED AIR FILTER
INTAKE/EXHAUST RESTRICTION
INTAKE AIR LEAK
TURBOCHARGER

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VISUALLY INSPECT THE AIR FILTER FOR DEBRIS OR RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK FOR AN AIR RESTRICTION IN THE TURBOCHARGER INLET AIR SYSTEM

1. Inspect all air intake, crankcase vent, charge air cooler and Turbocharger related tubes and hoses for damage, restrictions or poor connections or leaks.
2. Inspect the exhaust system and related tubes for damage, restrictions or poor connections.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Turbocharger assembly in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P023F-00-FUEL PUMP SECONDARY CIRCUIT-OPEN

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

COMPONENT FUNCTIONAL DESCRIPTION AND DIAGNOSTIC OVERVIEW - FUEL PUMP RELAY

Functional Operation of the Fuel Pump Relay: Depending on the type of relay being used for the Fuel Pump Relay, the approximate resistance of the relay coil should be:

- 72-98 Ohms for a mini relay (larger square relay).
- 94-114 Ohms for a micro relay (smaller rectangular relay).
- 160-225 Ohms for a Printed Circuit Board (PCB) relay.

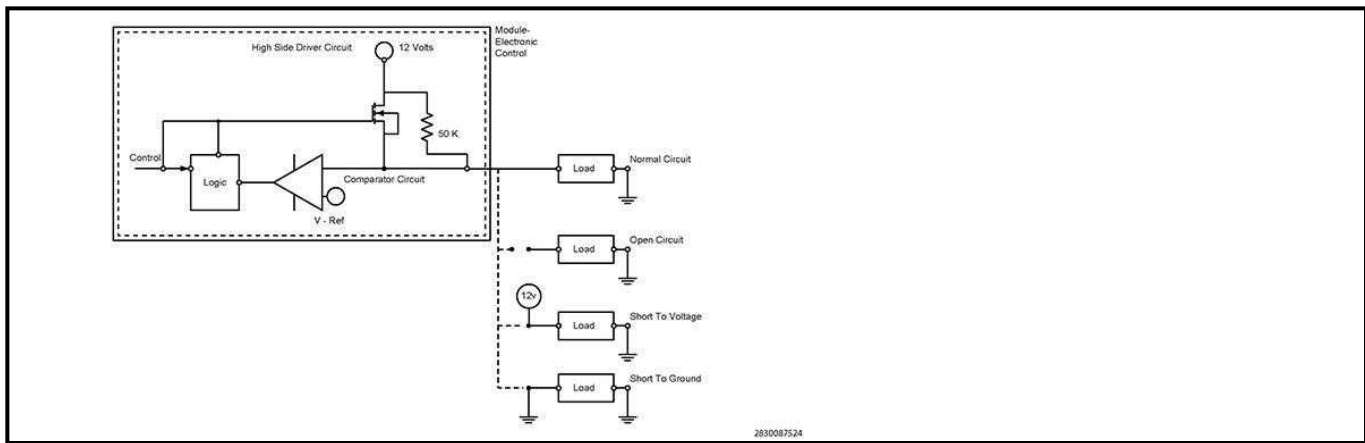
NOTE: The coil resistance of a relay or solenoid can vary based on factors like temperature or age of the component. Typically a 10% variance is allowed on a new component at room temperature. Therefore, do not always assume that a component that is measuring slightly outside of the tolerance given is faulty. A faulty component usually will be noticeably out of tolerance.

Diagnostic Overview: With the ignition on and the PCM energized, battery voltage should be present at the Fuel Pump Relay Control circuit at the PDC.

- Ignition on, but no voltage would indicate a open or short to ground on the Fuel Pump Relay Control Circuit. Lack of voltage may also indicate the PCM High Side Driver (HSD) is not operable, but this is not common.
- Ignition on voltage present would indicate a functioning PCM HSD.

Typical High Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides 12 volts to operate the device when switched on. The voltage could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. The graphic shows how the PCM performs diagnostics using an internal pull up diagnostic resistor and calibrated voltage reference (V-Ref) as a comparator for fault detection.

- **Circuit Open and Circuit High Detection:** The PCM monitors for an **open circuit** and **short to voltage** when the internal driver is switched off. A milliampere voltage is provided to the device through the **internal pull up diagnostic resistor** connected in series with the device. The diagnostic voltage is monitored between the pull up resistor and device, and compared to V-Ref. If the resistance in the device or circuitry becomes too large (approaches open) the voltage supply will increase on the **comparator circuit** and become greater than V-Ref, and a fault is detected. A short to Battery voltage will have the same effect. **An alternative method of fault detection for an open** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open.
- **Circuit Low Detection:** The PCM monitors for a **short to ground** when the driver is turned on. When switched on, the voltage to the device should be close to the 12 volt supply voltage. A short to ground will pull the voltage at the **comparator circuit** below V-Ref and a circuit low fault is detected. **An alternative method of fault detection for a short to ground** that is used is to monitor current draw when the internal driver is switched on. Excessive current draw detected would indicate a short to ground.



WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the ignition on.
- Battery voltage greater than 10.4 volts.
- The ASD Relay is energized.

SET CONDITION

- The PCM detects that the Fuel Pump Relay Control circuit is open or has high resistance.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUEL PUMP RELAY
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE FUEL PUMP (N9) RELAY CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE FUEL PUMP RELAY GROUND CIRCUIT IN THE PDC FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the Fuel Pump Relay to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the PDC (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

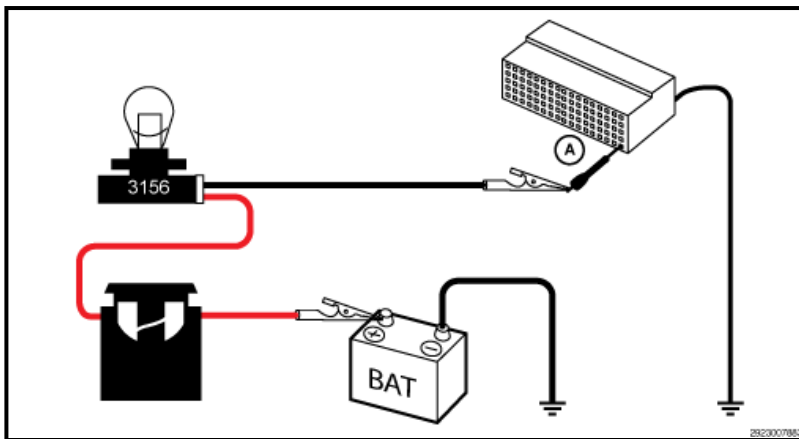
NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE:

Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

**NOTE:**

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information. Refer to **CENTER, POWER DISTRIBUTION (PDC), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK FUEL PUMP RELAY OPERATION

1. Refer to the Component Functional Description at the top of the test and check the relay operation.

Is the Fuel Pump Relay functioning properly?

Yes

- Go To [5](#)

No

- Replace the Fuel Pump Relay in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [**MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) received a message that the Fuel Pump Control Module Pulse Width Modulated (PWM) Feedback circuit voltage is below a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT OPEN/HIGH RESISTANCE
FUEL PUMP CONTROL MODULE PWM FEEDBACK CIRCUIT SHORTED TO GROUND
FUEL PUMP CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE FUEL PUMP CONTROL MODULE (N12) PWM FEEDBACK CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE FUEL PUMP CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Fuel Pump Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P225C-00 To P24D1-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P225C-00-NOX SENSOR 1/1 PERFORMANCE - SIGNAL STUCK HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the NOx Sensor 1/1 signal is above or below a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other aftertreatment DTCs (other than NOx Sensor DTCs), present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE (F204) FUSED IGNITION OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the (F204) Fused Ignition Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. INSTALL A NEW NOX SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [8](#)

No

- Replacing the NOx Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P225D-00-NOX SENSOR 1/1 PERFORMANCE - SIGNAL STUCK LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the NOx Sensor 1/1 signal is above or below a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any other aftertreatment DTCS (other than NOx Sensor DTCS), present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE (F204) FUSED IGNITION OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the (F204) Fused Ignition Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

6. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [7](#)

7. INSTALL A NEW NOX SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [8](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2266-00-WATER IN FUEL (WIF) SENSOR VOLTAGE TOO LOW

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- Low voltage detected at the Water In Fuel (WIF) Sensor signal circuit at the Powertrain Control Module (PCM).

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
WIF SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
WIF SENSOR SIGNAL CIRCUIT SHORTED TO THE (K923) WIF SENSOR GROUND
WATER IN FUEL SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE WIF SENSOR (G123) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn ignition off.
2. Disconnect the Water In Fuel (WIF) Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure resistance between the WIF Sensor (G123) Signal circuit and ground at the WIF Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the short to ground in the WIF Sensor (G123) Signal circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK FOR THE WIF SENSOR (G123) SIGNAL CIRCUIT SHORTED TO THE (K923) SENSOR GROUND

1. Measure the resistance between the WIF Sensor (G123) Signal circuit and the (K923) Sensor ground circuit at the sensor connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the WIF Sensor (G123) Signal circuit and the (K923) Sensor ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. INSTALL A NEW WATER IN FUEL SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Water In Fuel Sensor in accordance with the Service Information.
3. Reconnect the PCM C1 harness connector.
4. Turn ignition on, engine not running.
5. With the scan tool erase DTCs.
6. With the scan tool, view active DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the Water In Fuel Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2269-00-WATER IN FUEL CONDITION

For a complete FUEL DELIVERY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Water-In-Fuel (WIF) sensor is attached to the fuel filter. The Powertrain Control Module (PCM) provides a 5-Volt reference signal to the water in fuel sensor. When the water collected in the fuel filter covers the sensor probes, the Water-In-Fuel sensor then pulls the 5-Volt reference voltage low indicating high water accumulation in the fuel filter.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the PCM is powered.

SET CONDITION

- Water in fuel indicated from the Water In Fuel (WIF) Sensor.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
WATER IN FUEL
WATER-IN-FUEL SENSOR (WIF)
WIF SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS PRESENT

1. With the scan tool, read DTCs.

Do you have any additional water in fuel DTCs?

Yes

- Repair other Water in fuel sensor DTCs first.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK FOR WATER IN THE FUEL SEPARATOR

1. Turn the ignition off.
2. Using the service publications as a guide, drain the water in fuel separator.

Did the DTC become inactive after draining the water in fuel separator?

Yes

- Clear DTC, repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO READ THE WATER-IN-FUEL SENSOR SIGNAL

1. Disconnect the WIF Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary.

2. Turn the ignition on.
3. Using the scan tool, read DTCs.

Did DTC P2269 become active?

Yes

- Replace the Water-In-Fuel Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE WIF SENSOR (G123) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

3. Measure the resistance between ground and the WIF Sensor (G123) Signal circuit at the WIF Sensor harness connector.

Is the resistance below 10k Ohms?

Yes

- Repair the WIF Sensor (G123) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P226C-00-TURBOCHARGER BOOST CONTROL "A" SLOW RESPONSE

THEORY OF OPERATION

The Boost Pressure Actuator is an electronically operated DC motor designed to regulate the boost pressure output of the turbocharger. The boost pressure actuator is mounted on the side of the turbocharger assembly. The PCM will run a test to evaluate the response from the boost pressure actuator by commanding the actuator to move through its full position range for a calibrated time. During the test the PCM will evaluate the response based on a calculated characteristic value which is calculated from the exhaust pressure changes seen during the test. This test is only done once per drive cycle while the engine is idling and the engine coolant temperature is above 75B°C (167B°F).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the engine is at idle and coolant temperature is above 75B°C (167B°F)

SET CONDITION

- The Powertrain Control Module (PCM) detects that the VGT is slow in responding to it's commanded position.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
TURBO EXHAUST PRESSURE SENSOR
EXHAUST LEAKS
PLUGGED EXHAUST PORTS
TURBOCHARGER BOOST ACTUATOR
TURBOCHARGER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 300.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Turn ignition on.
2. With the scan tool, read DTCs.

Are there any other Turbocharger, EGR Airflow Control Valve, Mass Air Flow Sensor, or Intake System leak related DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE LINKAGE FOR DAMAGE OR POOR FIT

1. Visually check the linkage for any damage, obstruction and/or physical interference. (Do not disconnect linkage.)

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE TURBOCHARGER FOR DEBRIS OR BINDING

1. Check the Turbocharger for excessive coking on the slip ring.

NOTE: **The Turbocharger should move freely without sticking.**

2. Check the Turbocharger for debris or binding.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. REPLACE THE TURBOCHARGER AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 300.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty Turbocharger repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2279-00-INTAKE AIR SYSTEM LEAK

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Mass Air Flow (MAF) Sensor is a multi-function smart device. The Powertrain Control Module (PCM) monitors the MAF Sensor signal directly through the hard-wired signal circuit like a typical MAF Sensor. The MAF Sensor also has an internal Intake Air Temperature Sensor, Humidity Sensor, and Inlet Air Pressure Sensor. The MAF Sensor communicates this information to the PCM over the LIN Bus circuit. The MAF Sensor also performs diagnostics on the internal air temperature sensor and reports faults to the PCM over the LIN Bus circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that there is an Intake Air leak.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
AIR LEAKS
EXHAUST GAS RECIRCULATION (EGR) VALVE
MASS AIR FLOW (MAF) SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Start the engine and allow it to reach normal operating temperature.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Reference, MAF Sensor, Intake Air System, Turbocharger or EGR System DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE AIR FILTER FOR TEARING OR IMPROPER INSTALLATION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for tearing or improperly installed. This condition may cause excessive air flow.

Were any of these problems found?

Yes

- Replace the Air Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK FOR AIR LEAKS IN THE INTAKE SYSTEM

1. Remove the Inlet Pressure Sensor.
2. Connect smoke machine 84-04 to the Inlet Pressure Sensor port in the intake duct and begin injecting smoke into the intake system.
3. Observe all intake system components for evidence of smoke leakage.

Is there evidence of smoke leakage?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE EGR VALVE FOR PROPER OPERATION

NOTE: An EGR Valve that is stuck partially open can cause this DTC to set. Hard starting, rough running and black smoke from the tailpipe are signs of an EGR Valve that is stuck open.

1. While starting and test driving the vehicle, observe for the conditions mentioned in the note above.

Does the vehicle exhibit these conditions?

Yes

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Mass Air Flow Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2280-00-AIR FLOW RESTRICTION

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a rapid decrease in pressure from the Inlet Air Pressure Sensor on the Air box.

DEFAULT ACTION

- EGR flow is disabled.
- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
DEBRIS BLOCKING THE INLET HOSE
SEVERELY RESTRICTED AIR FILTER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

VISUALLY INSPECT FOR A RESTRICTION IN THE AIR FILTER AN INLET HOSE

1. Turn ignition off.
2. Perform a visual inspection of the Inlet hose for debris, such as snow packing or dirt loading blocking the passage.

Was a restriction found?

Yes

- Clean the debris from the passage way. Check and replace the Air Filter if necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Air Filter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2297-00-O2 SENSOR 1/1 OUT OF RANGE DURING DECELERATION

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Powertrain Control Module (PCM) monitors the exhaust gases for oxygen content and varies the rich/lean fuel mixture of the intake air fuel mixture to adjust the system. The monitor evaluates response time of the O2 Sensor during transition from load to overrun mode using the O2 concentration (corrected for exhaust pressure) signal. The PCM will illuminate the MIL lamp when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the engine is running at zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).

SET CONDITION

- The Powertrain Control Module (PCM) will set the fault if it detects that the O2 Sensor measurement is too low at zero fueling event.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR 1/1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXCESSIVE FUEL ENTERING THE AFTERTREATMENT/EXHAUST SYSTEM
MASS AIR FLOW (MAF) SENSOR
ENGINE MISFIRE
FUEL DELIVERY SYSTEM FAILURE
INTAKE AIR SYSTEM LEAK
EXHAUST SYSTEM LEAK
EGR SYSTEM LEAK
O2 SENSOR

Possible Causes

POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for 75 seconds.
5. Start the engine and drive the vehicle at 50 MPH. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal). Repeat 3-5 times.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR A MODIFIED OR AFTERMARKET AIR FILTER BOX

NOTE: This fault can potentially be set by an aftermarket Air Filter Box and/or filter. Non factory filter assemblies are not calibrated to the factory PCM thresholds or settings. If the vehicle has a modified filter assembly and this fault is set, notify the customer that the vehicle needs to be returned back to the stock assembly in order to properly repair the vehicle.

1. Visually inspect for an aftermarket Air Filter Box and/or filter.

Was the Air Filter Box and/or filter modified or aftermarket?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any cylinder misfire, Crank Sensor, MAF/Intake Air Sensor, Boost Pressure Sensor, Differential Pressure Sensor, or Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**4**](#)

4. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the O2 Sensor 1/1 (K41) Signal circuit at the Oxygen Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [**5**](#)

No

- Repair the O2 Sensor 1/1 (K41) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE O2 SENSOR 1/1 (K41) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance between of the (K41) O2 Sensor 1/1 Signal circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the O2 Sensor 1/1 (K41) Signal circuit for an open/high resistance
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**6**](#)

6. CHECK THE FUEL DELIVERY SYSTEM

1. Reconnect the O2 Sensor 1/1 harness connector.
2. Reconnect the PCM C1 harness connector.
3. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [**CHECKING THE FUEL DELIVERY SYSTEM**](#) .

Were any fuel system problems found?

Yes

- Perform the appropriate repairs to the fuel system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. CHECK THE INTAKE AND EXHAUST SYSTEMS FOR RESTRICTIONS

1. Turn the ignition off.
2. Inspect the exhaust system for damaged components that could cause exhaust flow blockage.
3. Inspect all air intake, crankcase vent and turbocharger related hoses/tubes and connections for blockage or other damage.
4. Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#) .

,

Is there evidence of a leak?

Yes

- Perform the appropriate repair as indicated.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK THE EGR SYSTEM FOR LEAKS

1. Check for visible signs (soot streaks) of external EGR system leaks around the V-band clamps and connections. Ensure that all torques are within specifications.

Were any EGR system leaks found?

Yes

- Perform the appropriate repairs to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. VISUALLY CHECK THE O2 SENSOR FOR SOOT BUILDUP

NOTE: Excessive soot build up can be caused by over fueling. If excessive soot build up is present, the fuel system operation should be checked and the

O2 sensor should be cleaned.

1. Remove the O2 Sensor.
2. Clean the soot from the O2 Sensor.
3. Reinstall the O2 Sensor.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Turn the ignition off for 75 seconds.
7. Start the engine and drive the vehicle at 50 MPH. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal). Repeat 3-5 times.
8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [11](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Reconnect the PCM C1 harness connector.
2. Install a new Oxygen Sensor in accordance with the Service Information.
3. Start the engine.
4. Turn the ignition off for 75 seconds.
5. Start the engine and drive the vehicle at 50 MPH. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal). Repeat 3-5 times.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [12](#)

No

- Replacing the Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2299-00-BRAKE PEDAL POSITION/ACCELERATOR PEDAL POSITION INCOMPATIBLE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- No Brake or APP Sensor faults present.

SET CONDITION

- The PCM recognizes a brake application following the APPS showing a fixed pedal opening. Temporary or permanent.

DEFAULT ACTION

- ETC light will illuminate.
- When this code sets the Accelerator Pedal position in the PCM software will ramp to idle. If the Pedal voltage changes OR the brake pedal is released, the pedal position in the PCM software will ramp up to the Accelerator Pedal position and the ETC light will go out.

POSSIBLE CAUSES

Possible Causes
CUSTOMER PRESSING ACCELERATOR PEDAL AND BRAKE PEDAL, AND HOLDING THEM DOWN SIMULTANEOUSLY
BRAKE PEDAL OUT OF CALIBRATION
BRAKE PEDAL POSITION SENSOR
APP SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR ABS RELATED DTCS PRESENT

NOTE: When this code sets the pedal position in the PCM software will ramp to idle. If the Pedal voltage changes OR the brake pedal is released, the pedal position in the PCM software will ramp up to the pedal position and the ETC light will go out.

NOTE: The most likely cause of this DTC is caused by the customer driving with one foot on the Accelerator pedal and the other resting on the Brake Pedal or a Brake Pedal Position Sensor stuck in the pressed state. Ask the driver of the vehicle if these conditions apply to their driving habits before continuing.

1. With the scan tool, read ABS Module DTCs.

Are there any DTCs present in the ABS Module?

Yes

- Perform the appropriate diagnostic test in the ABS Module.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. PERFORM AN APP SENSOR SWEEP AND CHECK THE SENSOR VOLTAGE READINGS

1. Ignition on, engine not running.
2. With the scan tool, monitor both APP Sensor voltage readings.
3. Slowly press the accelerator pedal from idle until it reaches the end stop near the floor.
4. APP Sensor 1 voltage should start at approximately 0.45 volts and increase to approximately 4.6 volts with a smooth transition.
5. APP Sensor 2 voltage should start at approximately 0.22 volts and increase to approximately 2.31 volts with a smooth transition.

Does the voltage for the appropriate sensor follow the list specification?

Yes

- Visually inspect the BPP Sensor for Improper installation, damage or mechanical failure. If OK, replace the Brake Pedal Position Sensor.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Check the Signal and Return circuits for opens and shorts. If OK, Replace the APP Sensor Assembly in accordance with the Service Information. After installation is complete, with a scan tool select the ETC RELEARN function to relearn the APPS values.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P229E-00-NOX SENSOR CIRCUIT - BANK 1 SENSOR 2

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM determines that the NOx sensor doesn't achieve a calibrated temperature during initial warm up or the NOx Sensor does not maintain a calibrated temperature after warm up. This is a two Trip Fault.

DEFAULT ACTION

- ETC light will illuminate.
- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/2
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other Nox Sensor or aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 volt of battery voltage?

Yes

- Go To [7](#)

No

- Repair the Fused Ignition (F204) Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE NOX SENSOR 1/2 WIRING HARNESS AND CONNECTOR

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. INSTALL A NEW NOX SENSOR 1/2 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [9](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P229F-00-NOX SENSOR CIRCUIT RANGE/PERFORMANCE BANK 1 SENSOR 2

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs

- With engine running.

SET CONDITION

- The NOx Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 5.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/2
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are the P220A, P220B, U029D, or U029E DTCS or any aftertreatment DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE NOx SENSOR 1/2 WIRING HARNESS AND CONNECTOR

NOTE: The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the NOx Sensor 1/2 (Module) and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the NOx Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P22A0-00-NOX SENSOR 1/2 CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx Sensor 1/2 detects that the voltage supplied is below it's calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
NOX SENSOR 1/2

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F204) Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE NOX SENSOR 1/2 WIRING HARNESS AND CONNECTOR

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. INSTALL A NEW NOX SENSOR 1/2 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [7](#)

No

- Replacing the NOx Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P22A1-00-NOX SENSOR CIRCUIT HIGH - BANK 1 SENSOR 2

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx Sensor 1/2 detects that the voltage supplied is above it's calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
NOX SENSOR 1/2

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other Nox Sensor or aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the (Z908) Sensor Ground circuit for a short to voltage or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE NOX SENSOR 1/2 WIRING HARNESS AND CONNECTOR

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **6**

6. INSTALL A NEW NOx SENSOR 1/2 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To **7**

No

- Test complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P22A7-00-NOX SENSOR HEATER SENSE CIRCUIT RANGE/PERFORMANCE - BANK 1

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on

ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/1 heater resistance is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/1 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any NOx Sensor circuit, Fuel Injector, EGR, Turbocharger or DEF System DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. PERFORM AN INJECTOR KILL TEST AND CHECK FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK FOR EXCESSIVE ENGINE OIL BEING INTRODUCED INTO THE AFTERTREATMENT SYSTEM

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the aftertreatment system from the engine.

Was engine oil, fuel or moisture found in the Turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.
3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE:

This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P22FA-00-NOX SENSOR PERFORMANCE - SLOW RESPONSE HIGH TO LOW BANK 1 SENSOR 1

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal

diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 5.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are the P220A, P220B, U029D, or U029E DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. INSPECT THE DIESEL EXHAUST FLUID

1. Check for evidence of contamination or degraded fluid.

Is there is evidence of contamination or degraded fluid?

Yes

- Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure. Refer to [DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **6**

6. CHECK THE NOX SENSOR 1/1 WIRING HARNESS AND CONNECTOR

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the NOx Sensor 1/1 (Module) and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the NOx Sensor 1/1 in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P232A-00-TCM REQUEST-FORCED ENGINE SHUTDOWN

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine cranking.
- With the engine running.
- With the transmission shifter in Drive.

SET CONDITION

- The Powertrain Control Module (PCM) has receives a engine shutdown request from the Transmission Control Module (TCM).

DEFAULT ACTION

- The MIL will not illuminate.

POSSIBLE CAUSES

Possible Causes
DTC PRESENT IN THE TRANSMISSION CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

DTC PRESENT IN TRANSMISSION CONTROL MODULE

NOTE: **The TCM sends a request to the Powertrain Control Module (PCM) to shut the engine off when it detects certain malfunctions in the transmission.**

1. This is an informational DTC to inform you that there is a DTC stored in the Transmission Control Module.
2. Erase this DTC from the PCM after all TCM DTCs have been repaired.
3. Test drive or operate the vehicle in the conditions that set the original DTC.
4. Using a scan tool, read the TCM DTCs.

Did any TCM DTCs return?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Repair complete.

P240F-00-EGR SLOW RESPONSE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects a significant difference between the EGR actual position and commanded position for an extended period of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VALVE FOULED
EXHAUST GAS RECIRCULATION (EGR) VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any EGR DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CLEAN THE EGR VALVE AND RETEST FOR DTC

NOTE: EGR cleaning is critical to ensure proper valve operation. Failure to properly clean the EGR valve can result in misdiagnosis and unnecessary component replacement.

Reconnect the PCM C1 harness connector.

1. Remove and clean the EGR Valve in accordance with the Service Information.
2. Install the EGR valve.
3. Turn the ignition on.

4. With the scan tool, erase DTCs.
5. Turn the ignition off for 75 seconds.
6. Test Drive the vehicle.

Did the DTC return?

Yes

- Go To [4](#)

No

- Cleaning the EGR repaired the concern.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. INSTALL A NEW EGR VALVE AND RETEST FOR DTC

1. Install a new EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Test drive the vehicle
6. Using the scan tool, monitor for DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2413-00-EGR SYSTEM PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the EGR is stuck open or stuck closed for an extended period of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VALVE FOULED
EXHAUST GAS RECIRCULATION (EGR) VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CLEAN THE EGR VALVE AND RETEST FOR DTC

NOTE: EGR cleaning is critical to ensure proper valve operation. Failure to properly clean the EGR valve can result in misdiagnosis and unnecessary component replacement.

Reconnect the PCM C1 harness connector.

1. Remove and clean the EGR Valve in accordance with the Service Information.
2. Install the EGR valve.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off for 75 seconds.
6. Test Drive the vehicle.

Did the DTC return?

Yes

- Go To [3](#)

No

- Cleaning the EGR repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. INSTALL A NEW EGR VALVE AND RETEST FOR DTC

1. Install a new EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Test drive the vehicle
6. Using the scan tool, monitor for DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P241D-00-SCR INDUCEMENT - FORCED ENGINE SHUTDOWN

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) system holds a total of eight gallons of fluid. A series of warning levels to indicate to the customer when the fluid is low or incorrect. The Service DEF System - See Dealer Soon message will display on the Electronic Vehicle Information Center (EVIC) when the DTC is identified and reported to the Powertrain Control Module (PCM). Once the DTC is logged into the PCM memory, the Warning and Inducement Strategy begins. The Driver Warning and Inducement Strategy for a low fluid condition is as follows: The first warning will occur when the tank level is at approximately three gallons. The customer will here a chime and get an EVIC message reading "LOW DEF REFILL SOON". The second warning level will occur when the tank level is at approximately two gallons. The customer will here a chime and get an EVIC message reading "REFILL DEF ENGINE WILL NOT RESTART IN XXX MILES". If the message is ignored until the tank is empty, the vehicle will not start. The customer will here a chime and get an EVIC message reading "REFILL DEF ENGINE WILL NOT START". **The vehicle will not start until a minimum of two gallons of approved Diesel Exhaust Fluid is added to the tank .**

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the engine has been operated for an extended period of time with critical Selective Catalytic Reduction (SCR) faults active, and no repair action has been taken. This amount of time will vary, depending on which SCR faults are active. These other SCR faults can cause the inducement counter to initiate.

DEFAULT ACTION

- This is a non-MIL fault.
- Once the mileage counter reaches zero, The PCM will also set P241D-00.

POSSIBLE CAUSES

Possible Causes
OTHER DTC(S) SETTING

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to recorded DTCS.

Along with P241D, are or more of the following DTCS active or pending?: P05EE-00, P05F1-00, P05F2-00, P05F3-00, P1220-00, P203A-00, P203F-00, P2047-00, P208A-00, P208B-00, P20E8-00, P20E9-00, P20FA-00, P2200-00, P220A-00, P220B-00, P229E-00, P242D-00, P2BA9-00, U029D-00, and/or U029E-00.

Yes

- Perform the Diagnostics for those DTC(s) at this time.

P241F-00-EGR COOLER B EFFICIENCY BELOW THRESHOLD

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Low Pressure (LP) Exhaust Gas Recirculation (EGR) Cooler Temperature Sensor efficiency is below than a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FAULTY EXHAUST GAS TEMPERATURE (EGT) SENSOR(S) LP EGR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE SENSOR RETURN OPEN/HIGH RESISTANCE POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any EGR system related present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (K666) SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

**P242B-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE - BANK1
SENSOR 3**

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/3 is located in the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the SCR. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Sensor 1/3 reading is not increasing with engine operating temperature after engine startup.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/3

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS PRESENT

1. Turn the ignition on.
2. With the scan tool, read DTCs.

Are either of the Exhaust Gas Temperature Sensor 1/3 Low or High DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [2](#)

2. CHECK THE EXHAUST TEMPERATURE SENSOR 1/3 FOR PROPER OPERATION

1. Remove the Exhaust Gas Temperature Sensor 1/3 and reconnect the harness connector to the sensor. Monitor the scan tool, while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the sensor increase at least 5B°F on the scan tool?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

No

- Replace the Exhaust Gas Temperature Sensor 1/3 in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P242C-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK1 SENSOR 3

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/3 is located in the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the SCR. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the Exhaust Gas Temperature (EGT) 1/3 Temperature Signal circuit voltage is below a calibrated threshold for a pre-determined amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT 1/3 TEMPERATURE SIGNAL CIRCUIT SHORT TO GROUND
EGT 1/3 TEMPERATURE SIGNAL CIRCUIT SHORT TO THE SENSOR RETURN CIRCUIT
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE EGT 1/3 (K372) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the EGT Sensor 1/3 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the EGT Sensor 1/3 (K372) Signal circuit at the sensor Exhaust Gas Temperature 1/3 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the EGT 1/3 (K372) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK FOR THE EGT SENSOR 1/3 (K372) TEMPERATURE SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND

1. Measure the resistance between the EGT Sensor 1/3 (K372) Signal circuit and (K900) Sensor Ground circuit at the Exhaust Gas Temperature Sensor 1/3 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the EGT Sensor 1/3 (K372) Signal circuit and (K900) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST GAS TEMPERATURE SENSOR SIGNAL

1. Reconnect the EGT Sensor 1/3 harness connector.
2. Reconnect the PCM C2 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off for 75 seconds.
6. Disconnect the EGT Sensor 1/3 harness connector.
7. Turn the ignition on.
8. With the scan tool, read DTCs.

Does the DTC P242D become active?

Yes

- Replace the Exhaust Gas Temperature Sensor 1/3 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P242D-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH - BANK1 SENSOR 3

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/3 is located in the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the SCR. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Sensor 3 Signal circuit voltage is above a calibrated threshold for a pre-determined amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT 1/3 TEMPERATURE SIGNAL CIRCUIT SHORTED TO VOLTAGE

Possible Causes
EGT 1/3 TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/3
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGT SENSOR 1/3 (K372) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Temperature Sensor 1/3 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the EGT 1/3 (K372) Signal circuit at the Exhaust Gas Temperature Sensor 1/3 harness connector.

Is the voltage reading above 5.2 volts?

Yes

- Repair the EGT Sensor 1/3 (K372) Signal circuit for a short to voltage. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EGT SENSOR 1/3 (K372) TEMPERATURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

- 1.
2. Turn the ignition off.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the EGT Sensor 1/3 (K372) Signal circuit between the Exhaust Gas Temperature Sensor 1/3 harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the EGT Sensor 1/3 (K372) Signal circuit for an open or high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K900) Sensor ground circuit between the EGT Sensor 1/3 harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (K900) Sensor ground circuit for an open or high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. INSTALL A NEW EXHAUST GAS TEMPERATURE SENSOR 1/3

1. Install a new Exhaust Gas Temperature Sensor 1/3 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Exhaust Gas Temperature Sensor repaired the fault. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the muffler. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the Powertrain Control Module (PCM) with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure from each hose and measures the delta pressure (difference between the inlet and outlet) in the Diesel Particulate Filter.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects excessive pressure at the particulate filter or the Exhaust Differential Pressure Sensor signal is below the calibrated threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE (K951) EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE (K951) EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT
DAMAGED EXHAUST SYSTEM
LEAKING EXHAUST SYSTEM
HOSE/TUBE CONNECTIONS TO THE EXHAUST DIFFERENTIAL PRESSURE SENSOR
EXHAUST DIFFERENTIAL PRESSURE SENSOR
DIESEL PARTICULATE FILTER (DPF)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE (K354) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Differential Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the (K354) 5-Volt Supply circuit in the Exhaust Differential Pressure Sensor harness connector.

Is the voltage above 4.8 volts?

Yes

- Go To [3](#)

No

- Repair the (K354) 5-Volt Supply circuit for an open or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between ground and the Exhaust Differential Pressure Sensor (K355) Signal circuit at the Exhaust Differential Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK FOR THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT SHORTED TO THE (K951) SENSOR GROUND CIRCUIT

1. Measure the resistance between the Exhaust Differential Pressure Sensor (K355) Signal circuit and the (K951) Sensor Ground circuit at the Exhaust Differential Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for a short to the (K951) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Exhaust Differential Pressure Sensor (K355) Signal circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. PERFORM A VISUAL INSPECTION OF EXHAUST SYSTEM

1. Turn the ignition off.
2. Visually inspect the Exhaust Differential Pressure Sensor tubes and/or hoses for physical damage, or signs of a leak or restriction at the sensor and exhaust pipe.
3. Visually inspect the entire exhaust system for bent, crushed or otherwise damaged tubes which may cause an exhaust system restriction.
4. Inspect the exhaust system for exhaust leaks.
5. Disconnect the hose lines from the differential pressure sensor. Blow compressed air into the hose lines and reconnect the differential pressure sensor.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Connect a jumper wire between the (K354) 5-Volt Supply circuit and the Exhaust Differential Pressure Sensor (K355) Signal circuit at the Exhaust Differential Pressure Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, view DTCs.

NOTE: The scan tool should display DTC P2455-00 Diesel Particulate Filter Differential Pressure Too High as active with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Go To [8](#)

No

- Go To [9](#)

8. REPLACE THE EXHAUST DIFFERENTIAL PRESSURE SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Exhaust Differential Pressure Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Test drive the vehicle
6. With the scan tool, view DTCs in the PCM.

Is the status Active for this DTC?

Yes

- Replace the Diesel Particulate Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the Exhaust Differential Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2453-00-DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the muffler. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the Powertrain Control Module (PCM) with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure from each hose and measures the delta pressure (difference between the inlet and outlet) in the Diesel Particulate Filter.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Differential Pressure Sensor Signal is implausible or the delta pressure reading is too low.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
DIFFERENTIAL PRESSURE FILTER (DPF) TUBES OR HOSES DAMAGED, LOOSE, OR DISCONNECTED
EXHAUST DIFFERENTIAL PRESSURE SENSOR
DIESEL PARTICULATE FILTER SOOT LOAD AT MAXIMUM LEVEL
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Reference DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE DPF TUBES AND HOSES

1. Ignition off.
2. Inspect the DPF tubes and hoses for leaks, restrictions or damage.

Were any issues found with the tubes or hoses?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE (K354) 5-VOLT SUPPLY CIRCUIT FOR OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Exhaust Differential Pressure Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the (K354) 5-Volt Supply circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [**5**](#)

No

- Repair the (K354) 5-Volt Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance of the Exhaust Differential Pressure Sensor (K355) Signal circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [**6**](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE (K951) SENSOR GROUND CIRCUIT FOR OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K951) Sensor Ground circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (K951) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Connect a jumper between the Exhaust Differential Pressure Sensor (K355) Signal circuit and the (K951) Sensor Ground circuit in the Exhaust Differential Pressure Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, select View DTCs.

NOTE: The scan tool should display a P2454-Exhaust Differential Pressure Sensor Low DTC with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Exhaust Differential Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. PERFORM A DIESEL PARTICULATE FILTER REGENERATION AND RETEST FOR DTC

1. Start and idle the engine.
2. With the scan tool, erase DTCs in the PCM.
3. With the scan tool, perform the Diesel Particulate Filter Regeneration procedure.
4. After this procedure is complete, turn the ignition off for 60 seconds.
5. Test drive the vehicle.
6. With the scan tool, view DTCs.

Is the status Active for this DTC?

Yes

- Go To [9](#)

No

- Performing the Diesel Particulate Filter Regeneration procedure repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2454-00-DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the muffler. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the Powertrain Control Module (PCM) with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure from each hose and measures the delta pressure (difference between the inlet and outlet) in the Diesel Particulate Filter.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Exhaust Differential Pressure Sensor signal is the calibrated threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT
EXHAUST DIFFERENTIAL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE (K354) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Differential Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the (K354) 5-Volt Supply circuit in the Exhaust Differential Pressure Sensor harness connector.

Is the voltage above 4.8 volts?

Yes

- Go To [4](#)

No

- Repair the (K354) 5-Volt Supply circuit for an open or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between ground and the Exhaust Differential Pressure Sensor (K355) Signal circuit at the Exhaust Differential Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK FOR THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT SHORTED TO THE (K951) SENSOR GROUND CIRCUIT

1. Measure the resistance between the Exhaust Differential Pressure Sensor (K355) Signal circuit and the (K951) Sensor Ground circuit at the Exhaust Differential Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [6](#)

No

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for a short to the (K951) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Exhaust Differential Pressure Sensor (K355) Signal circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the Exhaust Differential Pressure (K355) Sensor Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Connect a jumper wire between the (K354) 5-Volt Supply circuit and the Exhaust Differential Pressure Sensor (K355) Signal circuit at the Exhaust Differential Pressure Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, view DTCs.

NOTE: The scan tool should display a P2455-Exhaust Differential Pressure Sensor High DTC as active with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Exhaust Differential Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2455-00-DIESEL PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR CIRCUIT HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the muffler. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the Powertrain Control Module (PCM) with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure from each hose and measures the delta pressure (difference between the inlet and outlet) in the Diesel Particulate Filter.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Exhaust Differential Pressure Sensor signal is the calibrated threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST DIFFERENTIAL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
EXHAUST DIFFERENTIAL PRESSURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST DIFFERENTIAL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE EXHAUST DIFFERENTIAL PRESSURE SENSOR (K355) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Differential Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the Exhaust Differential Pressure Sensor (K355) Signal circuit in the Exhaust Differential Pressure Sensor harness connector.

Is the voltage above 5.0 volts?

Yes

- Repair the Exhaust Differential Pressure Sensor (K355) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE (K951) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the (K951) Sensor Ground circuit between the Exhaust Differential Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K951) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST DIFFERENTIAL PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Connect a jumper wire between the (K951) Sensor Ground circuit and the Exhaust Differential Pressure Sensor (K355) Signal circuit in the Exhaust Differential Pressure Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, view DTCs.

NOTE: **The scan tool should display a P2454-Exhaust Differential Pressure Sensor Low DTC with the jumper wire in place.**

Does the scan tool display the DTC as described above?

Yes

- Replace the Exhaust Differential Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2457-00-EXHAUST GAS RECIRCULATION COOLING SYSTEM PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- Exhaust Gas Recirculation (EGR) Temperature Sensor is reading higher than a calibrated value for more than 0.2 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS RECIRCULATION (EGR) COOLER

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Are there any other 5-Volt Reference, EGR Temperature Sensor, Coolant Temperature, Fuel System or EGR Valve DTCs?

Yes

- Repair other DTCs before proceeding.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CLEAN THE EGR COOLER AND RETEST FOR DTC

1. Remove and clean the EGR Cooler with approved Mopar EGR system cleaner.
2. Reinstall the EGR Cooler.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Start the engine. It may be necessary to test drive the vehicle.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the EGR Cooler in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Cleaning the EGR Cooler repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

THEORY OF OPERATION

The Diesel Particulate Filter (DPF) is designed to physically filter soot and to eliminate hydrocarbons from the engine exhaust gases through catalyst reactions in the exhaust stream. Federal law requires that the filter's efficiency be monitored for signs of degradation that would compromise the efficiency of the filter. The Powertrain Control Module (PCM) monitors the efficiency of the DPF using data received from the Particulate Matter (PM) Sensor which monitors the amount of soot particles that are allowed past the DPF. The PCM will illuminate the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails in two consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine is running.

SET CONDITION

- If between two Diesel Particulate Filter regeneration events, the DPF soot loading rate is faster than the threshold or if the time between two regeneration events is less than the calibrated time threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL SYSTEM OR AIR HANDLING SYSTEM SENSOR FAILURE
AFTERTREATMENT DPF DIFFERENTIAL PRESSURE SENSOR
BASE ENGINE FAILURE
FUEL SYSTEM FAILURE
AIR HANDLING SYSTEM FAILURE
DIESEL PARTICULATE FILTER RESTRICTED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Turn the ignition on.
2. With the scan tool, read DTCS.

Were there any fuel system or air handling sensor DTCS present?

Yes

- If this DTC is present along with any fuel system or air handling system sensor DTCS, repair those DTCS before proceeding.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE AFTERTREATMENT DPF DIFFERENTIAL PRESSURE SENSOR/HOSES FOR BLOCKAGE OR LEAKS

1. Check the aftertreatment DPF differential pressure sensor tubes for plugging, kinks, or leakage.

Are the Aftertreatment DPF differential pressure sensor tubes blocked, kinked, or leaking?

Yes

- Clean or replace the Aftertreatment DPF Differential Pressure Sensor Tube(s) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK FOR INTAKE AND EXHAUST SYSTEM RESTRICTIONS

NOTE: **Damaged, restricted or poorly connected intake and turbocharger related tubes can cause this DTC to set.**

1. Inspect the entire air intake, crankcase vent and Turbocharger related hoses/tubes and connections for signs of a leak.
2. Inspect the complete exhaust system for damaged, bent or restricted pipes that can cause excessive back pressure or an exhaust leak.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were any problems found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK FOR BASE ENGINE FAILURES

1. Remove the exhaust pipe at the outlet of the Turbocharger Assembly.
2. Visually inspect for signs of oil, coolant or fuel contamination at the Turbocharger outlet.

Were any signs of contamination found?

Yes

- Diagnose and repair as necessary
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the after treatment Diesel Particulate Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P245A-00-EGR COOLER BYPASS CONTROL CIRCUIT OPEN

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Cooling Bypass system is used to redirect the EGR gases around the EGR Cooler when the engine is under certain operating conditions. The system consists of two devices.

The EGR Cooling Bypass Solenoid is a 2-wire electrical device. The solenoid is located on the Intake Manifold. This solenoid controls the crankcase vacuum supply to the EGR Cooling Bypass Actuator.

The EGR Cooling Bypass Actuator is a typical 'vacuum-diaphragm' device. The actuator is located on the EGR Cooler.

The Powertrain Control Module (PCM) will light a MIL lamp after this monitor runs and fails in two consecutive drive cycles. The PCM will turn off the MIL lamp after the diagnostic passes in four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGR Bypass Valve Signal circuit is open for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED MAIN RELAY OUTPUT CIRCUIT OPEN OR SHORT TO GROUND
EGR BYPASS VALVE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EGR COOLING BYPASS SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE MAIN FUSED RELAY (F343) OUTPUT CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Cooling Bypass Solenoid harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Main Fused Relay (F343) Output circuit at the EGR Cooling Bypass Solenoid harness connector.

Is the voltage equal to battery voltage?

Yes

- Go To [3](#)

No

- Repair the Main Fused Relay (F343) Output circuit for an open or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE EGR BYPASS VALVE (K670) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the EGR Bypass Valve (K670) Signal circuit between the EGR Cooling Bypass Solenoid harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the EGR Bypass Valve (K670) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ABILITY OF THE PCM TO READ THE EGR COOLING BYPASS VALVE ACTUATOR SIGNAL

1. Turn the ignition off.
2. Reconnect the PCM C2 harness connector.
3. Connect a jumper wire between ground and the EGR Cooler Bypass Valve Actuator (K670) Control circuit at the EGR Cooling Bypass Solenoid harness connector.
4. Turn the ignition on.
5. With the scan tool, view DTCs.

Did the P245C-00-EGR COOLER BYPASS CONTROL CIRCUIT LOW DTC set as active or pending with the jumper in place?

Yes

- Replace the EGR Cooling Bypass Valve Actuator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P245B-00-EGR-COOLER-BYPASS-CONTROL-CIRCUIT-PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Cooling Bypass system is used to redirect the EGR gases around the EGR Cooler when the engine is under certain operating conditions. The system consists of two devices.

The EGR Cooling Bypass Solenoid is a 2-wire electrical device. The solenoid is located on the Intake Manifold. This solenoid controls the crankcase vacuum supply to the EGR Cooling Bypass Actuator.

The EGR Cooling Bypass Actuator is a typical 'vacuum-diaphragm' device. The actuator is located on the EGR Cooler.

The Powertrain Control Module (PCM) will light a MIL lamp after this monitor runs and fails in two consecutive drive cycles. The PCM will turn off the MIL lamp after the diagnostic passes in four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects an over temperature condition on the EGR Bypass Valve Signal circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VACUUM SUPPLY HOSES DAMAGED OR CLOGGED
EGR COOLING BYPASS SOLENOID
EGR COOLER CLOGGED
EGR COOLING BYPASS ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are the P245A-00, P245C-00, or P245D-00 DTCs or any EGR DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EGR VACUUM SUPPLY HOSES FOR CLOGGING, LEAKS, OR OTHER DAMAGE

NOTE: This DTC is very often set due to damage to one of the Vacuum Supply Hoses.

1. Turn the ignition off.
2. Inspect the EGR Vacuum Supply Hose from the EGR to the EGR Cooling Bypass Solenoid.
3. Inspect the Vacuum Supply Hose from the EGR Cooling Bypass Solenoid to the EGR Cooling Bypass Actuator.

Is either EGR Vacuum Supply Hose kinked, pinched, leaking, or otherwise damaged?

Yes

- Replace the damaged EGR Vacuum Supply Hose in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE EGR VACUUM SUPPLY

1. Start the engine.
2. Run the engine until it reaches normal operating temperature.
3. Disconnect the EGR Vacuum Supply Hose (from the engine) at the EGR Cooling Bypass Solenoid.
4. Connect a vacuum gauge to the disconnected hose.

Does the vacuum gauge detect any vacuum coming from the engine?

Yes

- Go To [5](#)

No

- Determine the loss of EGR vacuum to the EGR Cooling Bypass Solenoid and repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE EGR COOLING BYPASS SOLENOID FOR PROPER OPERATION

1. Turn the ignition off.
2. Reconnect the EGR Vacuum Supply Hose (from the engine) back to the EGR Cooling Bypass Solenoid.
3. Disconnect the Vacuum Supply Hose at the EGR Cooling Bypass Solenoid. This is the hose routed from the EGR Cooling Bypass Solenoid to the EGR Cooling Bypass Actuator.
4. Start the engine.
5. Connect a vacuum gauge to the EGR Cooling Bypass Solenoid outlet nozzle.
6. Using a jumper wire connected to ground, back probe the EGR Bypass Valve (K670) Signal circuit.

Does the vacuum gauge detect any vacuum at the EGR Cooling Bypass Solenoid outlet nozzle?

Yes

- Go To [6](#)

No

- Replace the EGR Cooler Bypass Valve Solenoid in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. INSPECT THE EGR COOLER FOR A BLOCKAGE

1. Turn the ignition off.
2. Inspect the EGR Cooler for blockage.

Was the EGR Cooler free of blockage?

Yes

- Go To [7](#)

No

- Replace the EGR Cooler in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

7. INSTALL A NEW EGR COOLING BYPASS VALVE ACTUATOR AND RETEST FOR DTC

1. Install a new EGR Cooling Bypass Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Start the engine and test drive the vehicle.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Installing a new EGR Cooling Bypass Valve Actuator repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P245C-00-EGR COOLER BYPASS CONTROL CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Cooling Bypass system is used to redirect the EGR gases around the EGR Cooler when the engine is under certain operating conditions. The system consists of two devices.

The EGR Cooling Bypass Solenoid is a 2-wire electrical device. The solenoid is located on the Intake Manifold. This solenoid controls the crankcase vacuum supply to the EGR Cooling Bypass Actuator.

The EGR Cooling Bypass Actuator is a typical 'vacuum-diaphragm' device. The actuator is located on the EGR Cooler.

The Powertrain Control Module (PCM) will light a MIL lamp after this monitor runs and fails in two consecutive drive cycles. The PCM will turn off the MIL lamp after the diagnostic passes in four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGR Bypass Valve Signal circuit voltage is below the minimum threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR BYPASS VALVE SIGNAL CIRCUIT SHORTED TO GROUND
EGR COOLING BYPASS SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR BYPASS VALVE (K670) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the EGR Cooling Bypass Solenoid harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the EGR Bypass Valve (K670) Signal circuit at the EGR Cooling Bypass Solenoid harness connector.

Is the resistance below 10k Ohms?

Yes

- Repair the EGR Bypass Valve (K670) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO CONTROL EGR COOLER BYPASS VALVE SOLENOID OPERATION

1. Connect the PCM C2 harness connector.
2. Turn the ignition on.
3. With the scan tool, read DTCs.

NOTE: The scan tool should display DTC: P245A-00-EGR COOLER BYPASS CONTROL CIRCUIT OPEN as active or pending with the connector unplugged.

Did P245A-00 set with the connector unplugged.?

Yes

- Replace the EGR Cooling Bypass Solenoid in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P245D-00-EGR COOLER BYPASS CONTROL CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Cooling Bypass system is used to redirect the EGR gases around the EGR Cooler when the engine is under certain operating conditions. The system consists of two devices.

The EGR Cooling Bypass Solenoid is a 2-wire electrical device. The solenoid is located on the Intake Manifold. This solenoid controls the crankcase vacuum supply to the EGR Cooling Bypass Actuator.

The EGR Cooling Bypass Actuator is a typical 'vacuum-diaphragm' device. The actuator is located on the EGR Cooler.

The Powertrain Control Module (PCM) will light a MIL lamp after this monitor runs and fails in two consecutive drive cycles. The PCM will turn off the MIL lamp after the diagnostic passes in four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGR Bypass Valve Signal circuit voltage is above the maximum threshold for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR BYPASS VALVE SIGNAL CIRCUIT SHORTED TO VOLTAGE

Possible Causes
EGR COOLING BYPASS SOLENOID
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR BYPASS VALVE (K670) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Cooling Bypass Solenoid harness connector.
3. Disconnect the PCM C2 harness connector.
4. Turn the ignition on.
5. Measure the voltage of the EGR Bypass Valve (K670) Signal circuit at the EGR Cooling Bypass Solenoid harness connector.

Is there any voltage present?

Yes

- Repair the EGR Bypass (K670) Valve Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO CONTROL THE EGR COOLER BYPASS VALVE SOLENOID OPERATION

1. Turn the ignition off.
2. Connect the PCM C2 harness connector.

3. Connect a jumper wire between ground and the EGR Bypass Valve (K670) Signal circuit at the EGR Cooling Bypass Solenoid harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

NOTE: The scan tool should display DTC: P245A-00-EGR COOLER BYPASS CONTROL CIRCUIT LOW as active or pending with the jumper in place.

Did P245A-00 set with the jumper in place?

Yes

- Replace the EGR Cooling Bypass Solenoid in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2463-PARTICULATE FILTER RESTRICTION - SOOT ACCUMULATION BANK 1

THEORY OF OPERATION

The engine after treatment system monitor is used to determine the soot load in the After treatment Diesel Particulate Filter. Under normal operating conditions the after treatment Diesel Particulate Filter is self-cleaning, where soot is converted to ash. The soot load in the After treatment Diesel Particulate Filter is estimated using the Differential Pressure Sensor and the calculated soot output of the engine. This fault code can be triggered if the application is not operating at a duty cycle high enough to actively regenerate the After treatment Diesel Particulate Filter. It may be necessary to increase the duty cycle of the application in order to prevent excessive soot accumulation and plugging of the After treatment Diesel Particulate Filter. The Powertrain Control Module (PCM) will set this fault if it detects that the After treatment Diesel Particulate Filter is plugged or that the differential pressure across the Diesel Particulate Filter is above the calibrated moderately severe threshold limit. The PCM will illuminate the MIL lamp when the monitor runs and fails in three driving cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) will set this fault if it detects that the soot load in the Diesel Particulate Filter is above the calibrated threshold limit.

DEFAULT ACTION

- The MIL will illuminate.
- Engine Torque limited.

POSSIBLE CAUSES

Possible Causes
CUSTOMER DRIVING HABITS
OTHER DTCS INHIBITING REGENERATION
INTAKE AND EGR LEAKS OR RESTRICTIONS
OVER-FUELING
OTHER DRIVABILITY DTCS CREATING EXCESSIVE SOOT. P2463-00 WILL NEED TO BE RE-RUN AFTER OTHER DRIVABILITY DTCS ARE REPAIRED
DAMAGE TO THE AFTERTREATMENT SYSTEM. P2463-00 WILL NEED TO BE RE-RUN AFTER OTHER PHYSICAL AFTERTREATMENT REPAIRS ARE COMPLETED
OTHER AFTERTREATMENT DTCS CREATING EXCESSIVE SOOT. P2463-00 WILL NEED TO BE RE-RUN AFTER OTHER DRIVABILITY DTCS ARE REPAIRED
DIESEL PARTICULATE FILTER (DPF) PLUGGED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS PRESENT

NOTE: DTC P2463-00 is usually the result of a driveability or fuel system failure. This DTC indicates that there is an excessive soot level in the Aftertreatment Diesel Particulate Filter (DPF) and the DPF needs to be regenerated. This situation can be caused by a customer's driving habits. If this vehicle is not driven long enough to actively regenerate the DPF on its own, this can cause excessive soot buildup in the exhaust system. Low vehicle speeds, low load drive cycles, and short drive cycles are good examples.

NOTE: Excessive soot buildup in the exhaust system can also be caused by other driveability concerns related to engine operation. These can include intake air, turbo 'charged-air', fuel delivery, fuel control, Camshaft-Crankshaft synchronization, EGR-related symptoms, and Aftertreatment Feedback systems. In other words, virtually every driveability-related DTC can be a source of excessive soot buildup.

1. Check for the presence of the following DTCs:

- Fuel Injector Open DTCs: P0201-2-3-4-5-6
- Exhaust Gas Temp Catalyst Sensor DTCs: P0426-7-8
- Exhaust Gas Temp 1/1 Sensor DTCs: P0545-6 or P2080
- Accelerator Pedal Position Sensor DTCs: P2123, P2128, or P2138
- Turbocharger Performance DTCs: P0045, P0234, P0299, or P2D2F
- Certain other DPF-related DTCs: P24A0, P24A1, or P24A4
- Fuel Delivery DTCs: P0004 or P0091
- Intake Air leak DTC: P2279
- 5-volt Reference 3 DTC: P0697
- Oil Viscosity DTC: P1D30

Codes above inhibit regeneration and will cause the fault to set.

NOTE: If there are any of the DTCs listed above present, perform the Diagnostics for those DTC(s) before continuing with this one. Note: If these other DTCs are present, then those Diagnostics must be run first. But, then you must finish by returning to this P2463-00 Diagnostic. The reason you must return to P2463-00 is because: The DPF may need further cleaning, or may be so clogged that it needs to be replaced. Re-running the P2463-00 Diagnostic Tree will finish the repair(s) properly.

NOTE: If there are any other Aftertreatment-related DTCs present, perform the Diagnostics for those DTC(s) before continuing with this one. Note: If any other Aftertreatment DTCs are present, then those Diagnostics must be run first. But, then you must finish by returning to this P2463-00 Diagnostic. The reason you must return to P2463-00 is because: The DPF may need further cleaning, or may be so clogged that it needs to be replaced. Re-running the P2463-00 Diagnostic Tree will finish the repair(s) properly.

2. Ignition on, engine not running.
3. With the scan tool, read and document any DTCs present.

Are the other DTCs present besides P2463-00?

Yes

- Perform the Diagnostics for those other DTCs before continuing with this one.

NOTE: When the Diagnostic repairs for those other DTCs are completed, return to complete this P2463-00 Diagnostic Tree.

No

- Go To [2](#)

2. INSPECT THE INTAKE AND CHARGE AIR COOLER (CAC) SYSTEMS FOR DAMAGE, LEAKS, OR RESTRICTIONS

1. Visually inspect the Intake and CAC tubes and hoses for signs of physical damage, leaks or restrictions.

Were any problems found?

Yes

- Perform the necessary repairs
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. INSPECT THE AFTERTREATMENT SYSTEM FOR DAMAGE, LEAKS, OR RESTRICTIONS

1. Visually inspect the exhaust aftertreatment system tubes and hoses for signs of physical damage, leaks or restrictions.

Were any problems found?

Yes

- Perform the necessary repairs
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. INSPECT THE HP FUEL SYSTEM FOR ISSUES AND FUEL QUALITY

1. Visually inspect the fuel system tubes and hoses for signs of physical damage, leaks or restrictions.

Were any problems found?

Yes

- Perform the necessary repairs
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DIESEL PARTICULATE FILTER (DPF) FOR PROPER OPERATION

1. Turn the ignition on, engine off.
2. Using the scan tool, go to Data Display, DPF Flow Resistance.
3. Start the engine and rev it up to 2000 rpm's.

NOTE: DPF Flow Resistance should increase and gradually stabilize to a value at or below 1.00.

Did the DPF Flow Resistance stabilize at or below 1.00?

Yes

- Go To [6](#)

No

- Replace the Diesel Particulate Filter (DPF) according to the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. RUN THE SERVICE DIESEL PARTICULATE FILTER REGENERATION SCAN TOOL ROUTINE

1. Perform the DPF Stationary Regeneration procedure (Stationary Desoot). Refer to [FILTER, DIESEL PARTICULATE, STANDARD PROCEDURE](#).

NOTE: If the scan tool fails the routine on the first attempt, run the Regen routine a second time.

Did the scan tool fail the DPF routine for Oxicat Temp too high?

Yes

- Replace the Aftertreatment Diesel Particulate Filter (DPF) in accordance with the Service Information and reset the regenerative timers with the scan tool.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Test complete. The DPF should now be cleaned and ready for normal operation.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P246F-00-EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the

sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Exhaust Gas Temperature Sensor 1/4 is outside a calibrated value.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT 1/4 SENSOR TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K386) TEMPERATURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K388) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE EXHAUST GAS TEMPERATURE SENSOR 1/4 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Exhaust Gas Temperature Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2470-00-EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Exhaust Gas Temperature Sensor 1/4 is below a calibrated value.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/4 TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K386) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K386) SIGNAL CIRCUIT FOR A SHORT TO THE EGT SENSOR 1/4 (K388) RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE EXHAUST GAS TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Exhaust Gas Temperature Sensor 1/4 repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2471-00-EXHAUST GAS TEMPERATURE SENSOR 1-4 CIRCUIT HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Exhaust Gas Temperature Sensor 1/4 is above a calibrated value.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/4 TEMPERATURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/4
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K386) SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EGT SENSOR 1/4 (K388) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE EXHAUST GAS TEMPERATURE SENSOR 1/4 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Exhaust Gas Temperature Sensor 1/4 repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P249C-00-EXCESSIVE TIME TO ENTER CLOSED LOOP REDUCTANT INJECTION CONTROL

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the DEF pressure control remains in open loop longer than a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OTHER SCR, REDUCTANT, NOX, OR EGT DTCS PRESENT
EXHAUST GAS TEMPERATURE SENSOR
DEF SUPPLY LINE RESTRICTION
SCR CATALYST
DEF INJECTOR
DEF SUPPLY PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR SCR, REDUCTANT, NOX, OR EGT DTCS

NOTE: If there are any other SCR, Reductant, or NOx related DTCS present, the Diagnostics must be completed for those DTCS first before continuing with this one.

NOTE: If there are any Exhaust Gas Temperature (EGT) related DTCS present, perform the Diagnostics for those DTCS before continuing with this one.

1. Ignition on, engine not running.

2. Using the scan tool, view DTCs.

Are there any other SCR, Reductant, NO_x, or EGT DTCs present?

Yes

- Perform the Diagnostics for the SCR, Reductant, NO_x, EGT DTC(s).
- Then, come back and begin the Diagnostic Tree for this DTC (P249C-00) again.

No

- Go To [3](#)

3. CHECK FOR DIESEL EXHAUST FLUID LEAK

1. Turn the ignition on.
2. With the scan tool, navigate to Systems Tests and actuate the DEF Injector (Dosing Valve) Actuator Test.

NOTE: This will pressurize the system, making a leak easier to see.

3. Inspect for signs of a Diesel Exhaust Fluid leak at:

- DEF Injector and Injector connectors.
- DEF Heater Line.
- DEF Supply Pump Assembly.

NOTE: Diesel exhaust fluid will form white deposits around leaky fittings.

Were any leaks found?

Yes

- Repair or replace the faulty component in accordance with the Service Information.
- Then, go back to the beginning of the Diagnostic Tree for this DTC (P249C-00) and start over.

No

- Go To [4](#)

4. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine.
2. Raise the engine speed to 2500 RPMs for two minutes.

Do the temperature readings of the Exhaust Temperature Sensors change in value at least 5B°F?

Yes

- Go To [5](#)

No

- Replace the Exhaust Temperature Sensor that did not change in value by at least 5B°F or is not updating.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine and allow it to idle for 10 minutes.

2. With the scan tool, read the values of the Exhaust Temperature Sensors.

Do both temperature sensors read above 150B°F and are the values of the temperature sensors updating?

Yes

- Go To [6](#)

No

- Replace the Exhaust Temperature Sensor that is not above 150B°F or is not updating on the scan tool.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.

NOTE: **Leave the DEF Injector harness connector attached to the DEF Injector.**

3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: **This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.**

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the SCR Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- **If above 35 ml:** Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .
- **If below 26 ml:** Go To [7](#)

7. CHECK THE DEF SUPPLY LINE FOR A RESTRICTION

1. Check the DEF Supply line for a restriction.

Was there a restriction in the DEF Supply line?

Yes

- Replace the DEF Supply line in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [8](#)

8. CHECK THE OPERATION OF THE DEF SUPPLY PUMP AFTER REPLACING THE DEF INJECTOR

1. Replace the DEF Injector in accordance with the Service Information.

NOTE: At this time, the DEF Volume test must be performed again.

2. Turn ignition off.
3. Remove the DEF Injector from the decomposition tube.

NOTE: Leave the DEF Injector harness connector attached to the DEF Injector.

4. Place the DEF Injector in a container to capture the fluid sprayed.
5. Turn the ignition on.
6. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

7. Measure the amount of fluid sprayed after the test times out.

Is the DEF Volume test result still below 26 ml?

Yes

- Replace the DEF Supply Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P249D-00-CLOSED LOOP REDUCTANT INJECTION CONTROL AT LIMIT - FLOW TOO LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With Diesel Exhaust Fluid dosing is being commanded.

SET CONDITION

- The Powertrain Control Module (PCM) uses the NOx Sensor 1/1 feedback along with engine operating and environmental conditions to calculate the diesel exhaust fluid dosing rate. Fault sets if the PCM detects that the NOx Sensor levels are higher than expected.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF CONTAMINATION
DEF SUPPLY LINE RESTRICTION
SCR CATALYST
DEF INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Pump DTCs, DEF Pressure DTCs, NOx-related DTCs, or DEF Heater-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE DEF SYSTEM FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF delivery system for leaks.

Were there any found?

Yes

- Repair as needed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE DEF QUALITY

1. Turn the ignition off.
2. Test the qualify of the Diesel Exhaust Fluid. Refer to Diesel Exhaust Fluid Emissions, Diagnosis and Testing. Refer to [**DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING**](#) .

Were there any problems found with the quality of the Diesel Exhaust Fluid?

Yes

- Drain and refill the DEF tank with the correct application Diesel Exhaust Fluid.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK THE DEF INJECTOR FOR PROPER SPRAY VOLUME

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.
3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, actuate the Diesel Exhaust Fluid Injector Quantity Test.

NOTE:

This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the SCR Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE DEF SUPPLY LINE FOR RESTRICTION

1. Check the DEF Supply line for a restriction.

Was there a restriction in the DEF Supply line?

Yes

- Replace the DEF Supply line in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P249E-00-CLOSED LOOP REDUCTANT INJECTION CONTROL AT LIMIT - FLOW TOO HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With Diesel Exhaust Fluid dosing is being commanded.

SET CONDITION

- The Powertrain Control Module (PCM) uses the NOx Sensor 1/1 feedback along with engine operating and environmental conditions to calculate the diesel exhaust fluid dosing rate. Fault sets if the PCM detects that the NOx Sensor levels are higher than expected.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF CONTAMINATION
DEF SUPPLY LINE RESTRICTION
SCR CATALYST
DEF INJECTOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Pump DTCs, DEF Pressure DTCs, NOx-related DTCs, or DEF Heater-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DEF SYSTEM FOR LEAKS

1. Turn the ignition off.

2. Visually inspect the DEF delivery system for leaks.

Were there any found?

Yes

- Repair as needed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE DEF QUALITY

1. Turn the ignition off.
2. Test the qualify of the Diesel Exhaust Fluid. Refer to Diesel Exhaust Fluid Emissions, Diagnosis and Testing. Refer to [DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING](#) .

Were there any problems found with the quality of the Diesel Exhaust Fluid?

Yes

- Drain and refill the DEF tank with the correct application Diesel Exhaust Fluid.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR FOR PROPER SPRAY VOLUME

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.
3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, actuate the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the SCR Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE DEF SUPPLY LINE FOR RESTRICTION

1. Check the DEF Supply line for a restriction.

Was there a restriction in the DEF Supply line?

Yes

- Replace the DEF Supply line in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P249F-00-EXCESSIVE TIME TO ENTER CLOSED LOOP DPF REGENERATION CONTROL

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the Diesel Particulate Filter regeneration control remains in open loop longer than a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER PCM DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCS.

Are there any other DPF, PM Sensor, EGR, FRP, Injector, or O2 Sensor DTCS present?

Yes

- Perform the Diagnostics for those DTCS before continuing with this one.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P24A0-00-CLOSED LOOP DPF REGENERATION CONTROL AT LIMIT - TEMPERATURE TOO LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the DOC/DPF Catalyst temperature closed loop control is active and ambient air temperature is above a calibrated threshold.

SET CONDITION

- The Powertrain Control Module (PCM) will set this fault if it detects that the DOC/DPF Catalyst closed loop control fueling adjustment has reached it's maximum allowable fueling but is unable to reach the

target regeneration temperature.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST TEMPERATURES NOT HIGH ENOUGH TO ACTIVELY REGENERATE THE AFTERTREATMENT DIESEL PARTICULATE FILTER DUE TO OPERATING IN LIGHT LOAD CONDITIONS
FUEL OR EMISSION RELATED FAULTS
EXHAUST TEMPERATURE SENSORS FAILED IN-RANGE LOW
DOC/DPF CATALYST MISSING
DOC/DPF CATALYST DAMAGED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Were there any fuel system or air handling sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.

No

- Go To [3](#)

3. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Turn the ignition off for 10 minutes to allow the Exhaust Temperature Sensors to stabilize.
2. Turn the ignition on.
3. With the scan tool check the temperature values of the Exhaust Temperature Sensors.

Are the Exhaust Temperature Sensors reading within 43B°F of each other?

Yes

- Go To [4](#)

No

- Replace the Exhaust Temperature Sensor that is out of range as compared to the others.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR THE DOC/DPF CATALYST MISSING

1. Visually inspect the after treatment exhaust system.

Is the DOC/DPF Catalyst installed on the vehicle?

Yes

- Go To [5](#)

No

- Replace the DOC/DPF Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK FOR DAMAGE TO THE DOC/DPF CATALYST

1. Separate the exhaust and inspect the DOC/DPF Catalyst for internal damage or signs of face plugging.

Was any internal damage found in the DOC/DPF Catalyst?

Yes

- Replace the after treatment DOC/DPF Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Exhaust Gas Temperature Sensor 1/3 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P24A1-00-CLOSED LOOP DPF REGENERATION CONTROL AT LIMIT - TEMPERATURE TOO HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the DOC/DPF Catalyst temperature closed loop control is active and ambient air temperature is above a calibrated threshold.

SET CONDITION

- The Powertrain Control Module (PCM) will set this fault if it detects that the DOC/DPF Catalyst closed loop control fueling adjustment has reached it's maximum allowable fueling but is unable to reach the target regeneration temperature.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST TEMPERATURES NOT HIGH ENOUGH TO ACTIVELY REGENERATE THE AFTERTREATMENT DIESEL PARTICULATE FILTER DUE TO OPERATING IN LIGHT LOAD CONDITIONS
FUEL OR EMISSION RELATED FAULTS
EXHAUST TEMPERATURE SENSORS FAILED IN-RANGE LOW
DOC/DPF CATALYST MISSING
DOC/DPF CATALYST DAMAGED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Were there any fuel system or air handling sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.

No

- Go To [3](#)

3. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Turn the ignition off for 10 minutes to allow the Exhaust Temperature Sensors to stabilize.
2. Turn the ignition on.
3. With the scan tool check the temperature values of the Exhaust Temperature Sensors.

Are the Exhaust Temperature Sensors reading within 43B°F of each other?

Yes

- Go To [4](#)

No

- Replace the Exhaust Temperature Sensor that is out of range as compared to the others.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR THE DOC/DPF CATALYST MISSING

1. Visually inspect the after treatment exhaust system.

Is the DOC/DPF Catalyst installed on the vehicle?

Yes

- Go To [5](#)

No

- Replace the DOC/DPF Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK FOR DAMAGE TO THE DOC/DPF CATALYST

1. Separate the exhaust and inspect the DOC/DPF Catalyst for internal damage or signs of face plugging.

Was any internal damage found in the DOC/DPF Catalyst?

Yes

- Replace the after treatment DOC/DPF Catalyst in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Exhaust Gas Temperature Sensor 1/3 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P24A4-00-PARTICULATE FILTER RESTRICTION - SOOT ACCUMULATION TOO HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Particulate Filter is an in-line canister filter located in the exhaust system between the engine and the SCR Catalyst. This filter captures and stores soot particles created by the diesel combustion process. As ash and soot accumulate in the filter, the exhaust pressure at the inlet side of the filter increases as compared to the pressure at the outlet side of the filter. This filter is monitored by the PCM with a Differential Pressure Sensor. There is a tube at the inlet and outlet of the Diesel Particulate Filter. A hose is attached to each tube. The other end of the hose is connected to the Differential Pressure Sensor. The Differential Pressure Sensor compares the pressure at the Mass Air Flow Sensor to the pressure at the differential pressure sensor. When this comparison exceeds a calibrated amount for a pre-determined amount of time, this DTC will set.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Differential Pressure Sensor signal indicates partial clogging of the particulate filter due to the accumulation of ash or other debris.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DAMAGED EXHAUST SYSTEM
LEAKING EXHAUST SYSTEM
HIGH RESISTANCE IN EXHAUST DIFFERENTIAL PRESSURE SENSOR CIRCUITS
HOSE/TUBE CONNECTIONS TO THE EXHAUST DIFFERENTIAL PRESSURE SENSOR
EXHAUST DIFFERENTIAL PRESSURE SENSOR
DIESEL PARTICULATE FILTER (DPF)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Exhaust Gas Pressures Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE INTAKE AIR SYSTEM FOR A RESTRICTION

1. Turn the ignition off.
2. Inspect the air filter for excessive dirt, soiling or other problems that may cause restricted air flow.
3. Inspect all air intake and Turbocharger related hoses/tubes and connections.

Were any leaks or restrictions found in the intake or Turbocharger systems?

Yes

- Repair the intake or Turbocharger system as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS OR RESTRICTIONS

1. Inspect the exhaust system for damaged components that could cause exhaust flow blockage or leak.

Were any leaks or restrictions found in the exhaust system?

Yes

- Repair the exhaust system as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE EGR SYSTEM VISUALLY AND USING A SCAN TOOL SELF TEST

1. Look for visible signs (soot streaks) of an external EGR leak.
2. With the scan tool, navigate to Miscellaneous Functions, and perform the EGR/ECU Self Test procedure.

Were any problems found with the EGR system?

Yes

- Perform the appropriate repairs to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE FUEL DELIVERY SYSTEM OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any fuel system issues found?

Yes

- Repair the fuel delivery system as necessary. Perform a regeneration of the Diesel Particulate Filter.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE DIESEL PARTICULATE FILTER OPERATION

1. With the scan tool, navigate to Miscellaneous Functions and perform the Diesel Particulate Filter Regeneration procedure.
2. Turn the ignition on, engine not running.
3. With the scan tool, clear DTCs in the PCM.
4. Start the engine.
5. Allow the engine to idle for up to five minutes.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Diesel Particulate Filter in accordance with the Service Information. With the scan tool, navigate to Miscellaneous Functions and perform the New DPF Initialization procedure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Test complete. The Stationary Regeneration Procedure sufficiently cleaned the Diesel Particulate Filter (DPF).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24AE-00-PARTICULATE MATTER SENSOR CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Particulate Matter (PM) Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 3.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
INCORRECT PM SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
PM SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P24D0, U12A3, U04A4, or U05A4 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter (PM) Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F205) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F205) Output circuit for an open or short to ground, or check the PM Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE PM SENSOR FOR PROPER OPERATION

1. The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.
2. Replace the PM Sensor in accordance with the Service Information.

3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24AF-00-PARTICULATE MATTER SENSOR CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Particulate Matter (PM) Sensor reports to the Powertrain Control Module (PCM) that the difference between the sensor temperature and the modeled exhaust gas temperature is greater than a calibrated threshold or less than a calibrated threshold. If the PCM detects that the failure is present for 5.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
INCORRECT PARTICULATE MATTER SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Verify that the correct application PM Sensor is being used before continuing with this Diagnostic tree.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P24D0, U12A3, U04A4, or U05A4 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PM Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F205) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F205) Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE PM SENSOR FOR PROPER OPERATION

1. The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.
2. Replace the PM Sensor in accordance with the Service Information.

3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P24B1-00-PARTICULATE MATTER SENSOR CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With engine running.

SET CONDITION

- The Particulate Matter (PM) Sensor detects that the voltage supplied is above it's calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN/HIGH RESISTANCE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other Aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PM Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [4](#)

No

- Repair the (Z908) Ground circuit for a short to voltage or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE PM SENSOR OPERATION

The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Install the PM Sensor in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the PM Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24B3-00-PARTICULATE MATTER SENSOR HEATER CONTROL CIRCUIT OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one

unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PM sensor reports to the PCM that the Supply Voltage is above or below a calibrated voltage threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
HIGH BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
PARTICULATE MATTER (PM) SENSOR
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for 75 seconds.

5. Turn the ignition on, run the engine to operating temperature

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE BATTERY AND CHARGING SYSTEM VOLTAGE

1. Check the Batteries and charging system for proper system voltage and operation. Refer to [DIAGNOSIS AND TESTING](#).

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [3](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE 12-VOLT SUPPLY TO THE SCR RELAY 2 CONTROL COIL

1. Turn the ignition off.
2. Remove the SCR Relay 2 from the PDC.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the 12-Volt supply at terminal 85 the SCR Relay 2 connector in the PDC.

Is the test light illuminated and as bright as a direct connection to the Battery?

Yes

- Go To [4](#)

No

- Check all of the fuses in the PDC. If a fuse is open, replace the fuse and retest. If no problems are found with the fuses, check the Battery supply to the PDC and the operation of the SCR Relay 2. If no problems are found, replace the PDC in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Reinstall the SCR Relay 2 in the PDC.
2. Turn the ignition on.

3. Using a 12-volt test light connected to ground, back probe the (K402) SCR Relay 2 Control circuit at the PDC connector.

NOTE: **The relay should make an audible click when closing. Another way to verify that the relay closed is to back probe and check for voltage on the relay output circuit.**

Did the relay close when connecting the (K402) SCR Relay 2 Control circuit to ground through the test light?

Yes

- Go To [5](#)

No

- Turn the ignition off. Disconnect the PDC connector and remove the SCR Relay 2. Isolate and check the continuity between terminal 86 of the relay connector and the output terminal at the PDC connector. If the resistance is below 3.0 Ohms, replace the SCR Relay 2. If the resistance is above 3.0 Ohms, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE ASD FUSED RELAY (K402) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PCM and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DMM to a known good ground.
4. With the positive lead of the DMM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE ASD FUSED RELAY (K402) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PCM and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DMM. **Note:** The meter leads can add resistance to the measurement value.

4. Connect one lead of the DMM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DMM to the circuit being tested at the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE SUPPLY VOLTAGE TO THE PM SENSOR

1. Turn the engine off.
2. Reconnect the PDC harness connector.
3. Reconnect the PCM harness connector.
4. Disconnect the PM Sensor (vehicle harness) harness connector.
5. Turn the ignition on, engine off.
6. Measure the voltage across the Fused Ignition (F205) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z909) Sensor Ground circuit at the PM Sensor harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z909) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PDC and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DMM to a known good ground.

4. With the positive lead of the DMM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PDC and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DMM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DMM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DMM to the circuit being tested at the PDC harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [11](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

11. CHECK THE PM SENSOR OPERATION

NOTE: **The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.**

1. Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
2. Connect the PM Sensor and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Replacing the Particulate Matter (PM) Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With engine running.

SET CONDITION

- The PM Sensor detects that the voltage supplied is above it's calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
PARTICULATE MATTER (PM) SENSOR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any other After treatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PM Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [4](#)

No

- Repair the (Z908) Sensor Ground circuit for a short to voltage or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE PM SENSOR OPERATION

The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Install the PM Sensor in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the PM Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24B7-00-PARTICULATE MATTER SENSOR HEATER RESISTANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PM sensor reports to the PCM that the Supply Voltage is above or below a calibrated voltage threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
HIGH BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
PARTICULATE MATTER (PM) SENSOR
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on, run the engine to operating temperature
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE BATTERY AND CHARGING SYSTEM VOLTAGE

1. Check the Batteries and charging system for proper system voltage and operation. Refer to **DIAGNOSIS AND TESTING** .

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [3](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE 12-VOLT SUPPLY TO THE SCR RELAY 2 CONTROL COIL

1. Turn the ignition off.
2. Remove the SCR Relay 2 from the PDC.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the 12-Volt supply at terminal 85 the SCR Relay 2 connector in the PDC.

Is the test light illuminated and as bright as a direct connection to the Battery?

Yes

- Go To [4](#)

No

- Check all of the fuses in the PDC. If a fuse is open, replace the fuse and retest. If no problems are found with the fuses, check the Battery supply to the PDC and the operation of the SCR Relay 2. If no problems are found, replace the PDC in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Reinstall the SCR Relay 2 in the PDC.
2. Turn the ignition on.
3. Using a 12-volt test light connected to ground, back probe the SCR Relay 2 (K402) Output circuit at the PDC connector.

NOTE: **The relay should make an audible click when closing. Another way to verify that the relay closed is to back probe and check for voltage on the relay output circuit.**

Did the relay close when connecting the SCR Relay 2 (K402) Output circuit to ground through the test light?

Yes

- Go To [5](#)

No

- Turn the ignition off. Disconnect the PDC connector and remove the SCR Relay 2. Isolate and check the continuity between terminal 86 of the relay connector and the output terminal at the PDC connector. If the resistance is below 3.0 Ohms, replace the SCR Relay 2. If the

resistance is above 3.0 Ohms, replace the Power Distribution Center (PDC) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SCR RELAY 2 (K402) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PCM and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SCR RELAY 2 (K402) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PCM and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DVOM to the circuit being tested at the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE SUPPLY VOLTAGE TO THE PM SENSOR

1. Turn the engine off.
2. Reconnect the PDC harness connector.
3. Reconnect the PCM harness connector.

4. Disconnect the PM Sensor (vehicle harness) harness connector.
5. Turn the ignition on, engine off.
6. Measure the voltage across the Fused Ignition (F205) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z908) Sensor Ground circuit at the PM Sensor harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z908) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [9](#)

9. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PDC and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PDC and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DVOM to the circuit being tested at the PDC harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [11](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK THE PM SENSOR OPERATION

NOTE: The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
2. Connect the PM Sensor and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Replacing the Particulate Matter (PM) Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24C2-00-EXHAUST GAS TEMPERATURE MEASUREMENT SYSTEM - MULTIPLE SENSOR CORRELATION BANK 1

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased

resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the absolute difference in measured temperature between a sensor and all other sensors is greater than a calibrated threshold for 0.05 seconds. This is a one Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE (EGT) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine.
2. Raise the engine speed to 2500 RPMs for two minutes.

Do the temperature readings of the Exhaust Temperature Sensors change in value at least 5B°F?

Yes

- Go To [3](#)

No

- Replace the Exhaust Temperature Sensor that did not change in value by at least 5B°F or is not updating.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine and allow it to idle for 10 minutes.
2. With the scan tool, read the values of the Exhaust Temperature Sensors.

Do both temperature sensors read above 150B°F and are the values of the temperature sensors updating?

Yes

- Go To [4](#)

No

- Replace the Exhaust Temperature Sensor that is not above 150B°F or is not updating on the scan tool.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24C6-00-PARTICULATE MATTER SENSOR TEMPERATURE CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PM Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 3.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
INCORRECT PM SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
PM SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P24D0, U12A3, U04A4, or U05A4 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT AND THE PM SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PM Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F205) Output circuit and the PM Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F205) Output circuit for an open or short to ground, or check the PM Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE PM SENSOR FOR PROPER OPERATION

1. The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.
2. Replace the PM Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replacing the PM Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P24C7-00-PARTICULATE MATTER SENSOR TEMPERATURE CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PM Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 3.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
INCORRECT PM SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
PM SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P24D0, U12A3, U04A4, or U05A4 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT AND THE PARTICULATE MATTER (PM) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the PM Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F205) Output circuit and the PM Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F205) Output circuit for an open or short to ground, or check the PM Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the PM Sensor and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE PM SENSOR FOR PROPER OPERATION

1. The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.
2. Replace the PM Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [7](#)

No

- Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P24D0-00-PARTICULATE MATTER SENSOR SUPPLY VOLTAGE CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Particulate Matter (PM) sensor reports to the PCM that the Supply Voltage is below a calibrated voltage threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
HIGH BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
PARTICULATE MATTER (PM) SENSOR
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on, run the engine to operating temperature
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE BATTERY AND CHARGING SYSTEM VOLTAGE

1. Check the Batteries and charging system for proper system voltage and operation. Refer to **DIAGNOSIS AND TESTING** .

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [3](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE 12-VOLT SUPPLY TO THE SCR RELAY 2 CONTROL COIL

1. Turn the ignition off.
2. Remove the SCR Relay 2 from the PDC.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the 12-Volt supply at terminal 85 the SCR Relay 2 connector in the PDC.

Is the test light illuminated and as bright as a direct connection to the Battery?

Yes

- Go To [4](#)

No

- Check all of the fuses in the PDC. If a fuse is open, replace the fuse and retest. If no problems are found with the fuses, check the Battery supply to the PDC and the operation of the SCR Relay 2. If no problems are found, replace the PDC in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Reinstall the SCR Relay 2 in the PDC.
2. Turn the ignition on.
3. Using a 12-volt test light connected to ground, back probe the SCR Relay 2 (K402) Output circuit at the PDC connector.

NOTE: **The relay should make an audible click when closing. Another way to verify that the relay closed is to back probe and check for voltage on the relay output circuit.**

Did the relay close when connecting the SCR Relay 2 (K402) Output circuit to ground through the test light?

Yes

- Go To [5](#)

No

- Turn the ignition off. Disconnect the PDC connector and remove the SCR Relay 2. Isolate and check the continuity between terminal 86 of the relay connector and the output terminal at the PDC connector. If the resistance is below 3.0 Ohms, replace the SCR Relay 2. If the resistance is above 3.0 Ohms, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE SCR RELAY 2 (K402) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PCM and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE SCR RELAY 2 (K402) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PCM and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DVOM to the circuit being tested at the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE SUPPLY VOLTAGE TO THE PM SENSOR

1. Turn the engine off.
2. Reconnect the PDC harness connector.
3. Reconnect the PCM harness connector.
4. Disconnect the PM Sensor (vehicle harness) harness connector.
5. Turn the ignition on, engine off.
6. Measure the voltage across the Fused Ignition (F205) Output circuit and the (Z908) Sensor Ground circuit at the PM Sensor (vehicle harness) harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [9](#)

No

- Go To [8](#)

8. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z908) Sensor Ground circuit at the PM Sensor harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z908) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PDC and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE FUSED IGNITION (F205) OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PDC and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DVOM to the circuit being tested at the PDC harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [11](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK THE PM SENSOR OPERATION

NOTE: The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Replace the Particulate Matter (PM) Sensor in accordance with the Service Information.
2. Connect the PM Sensor and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Replacing the Particulate Matter (PM) Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P24D1-00-PARTICULATE MATTER SENSOR REGENERATION INCOMPLETE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Particulate Matter (PM) Sensor is used to determine the efficiency of the Diesel Particulate Filter (DPF) by measuring the amount of particulate matter (soot) remaining in the exhaust gas after the DPF. The PM Sensor is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst, and consists of a probe and module. The probe and module cannot be serviced (or diagnosed) separately. The probe and module are serviced as one unit. The module communicates with the Powertrain Control Module (PCM) over CAN Bus communication circuits.

The probe contains three internal parts: a heater, a temperature sensor, and a set of particulate measuring electrodes with a high electrical resistance. During normal operation, the module will activate the heater and perform a regeneration of the electrodes to burn off any deposited soot before taking a measurement. After sensor regeneration is complete, soot particles from the exhaust gas are then collected onto the electrodes and form conductive paths between the electrodes leading to a drop of the electrical resistance. The decreased resistance results in an increased current across the electrodes, which is compared against calibrated thresholds to determine sensor functionality and DPF efficiency.

Before starting a new measurement, the PM Sensor will perform a regeneration of the electrodes to burn off the deposited soot so that each measurement starts at similar conditions. The regeneration is considered successful if the probe's heater is able to maintain the regeneration temperature and the PM Sensor transitions into measurement mode. The PCM will illuminate the Malfunction Indicator Lamp (MIL) when this DTC sets.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Particulate Matter (PM) Sensor reports that the regeneration procedure did not transition back into measurement mode within a calibrated number of times. If the PCM detects that the failure is present for 7.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PARTICULATE MATTER (PM) SENSOR
EXHAUST LEAK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P24D0-00, P24DA-00, P24AE-00, U04A4-00, or U05A4-00 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE PM SENSOR OPERATION

The PM Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the PM Sensor (Module) and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the PM Sensor in accordance with the Service Information.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P0407-00 To P0522-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P0407-00-EGR SENSOR B CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) Valve circuitry is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate after two consecutive failed trips.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO GROUND
LP EGR VALVE 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
LP EGR VALVE POSITION RETURN CIRCUIT OPEN/HIGH RESISTANCE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND CHECK THE LP EGR (K677) ACTUATOR (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR (K678) ACTUATOR (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE LP EGR (F859) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE LP EGR (K685) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE LP EGR (K662) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide

to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0408-00-EGR SENSOR B CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) Valve circuitry is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes

LP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
LP EGR VALVE 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
LP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
LP EGR VALVE POSITION RETURN CIRCUIT SHORTED TO VOLTAGE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE LP EGR (K677) ACTUATOR (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. ISOLATE AND CHECK THE (K678) ACTUATOR (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE LP EGR (F859) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE LP EGR (K685) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. ISOLATE AND CHECK THE LP EGR (K662) RETURN CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P040B-00-EGR TEMPERATURE SENSOR 1 CIRCUIT PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the key is on and battery voltage is above 10.4 Volts.

SET CONDITION

- The PCM monitors the values of the EGR Outlet Temperature Sensor and the Charge Air Cooler (CAC) Out Temperature Sensor. This is done during a calibrated amount of engine-off time. If the PCM determines the EGR Outlet Temperature Sensor Signal is above or below a calibrated threshold for 3.0 seconds or the difference between the two Sensors exceeds a calibrated threshold correlation for 0.1 seconds, this fault will set. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR OUTLET TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there DTCS P007C, P007D, P040C, or P040D active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [**3**](#)

3. CHECK THE EGR OUTLET TEMPERATURE SENSOR OPERATION

1. Turn the ignition off.
2. Install the EGR Outlet Temperature Sensor.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Start the engine and let it run for two minutes.
7. With the scan tool, read PCM DTCS.

Did the DTC return?

Yes

- Go To [**4**](#)

No

- Replace the EGR Outlet Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P040C-00-EGR TEMPERATURE SENSOR 1 CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the key is on and battery voltage is above 10.4 Volts.

SET CONDITION

- The PCM detects that the EGR Outlet Temperature circuit voltage is below 0.5 Volts for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR OUTLET TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EGR OUTLET TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT

Possible Causes
EGR OUTLET TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR OUTLET TEMPERATURE SENSOR (K935) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Disconnect the EGR Outlet Temperature Sensor harness connector.

NOTE: **Check connectors - Clean/repair as necessary.**

4. Measure the resistance between ground and the EGR Outlet Temperature Sensor (K935) Signal circuit at the EGR Outlet Temperature Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the EGR Outlet Temperature Sensor (K935) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE EGR OUTLET TEMPERATURE SENSOR (K935) SIGNAL CIRCUIT FOR A SHORT TO THE (K915) SENSOR GROUND CIRCUIT

1. Measure the resistance between the (K935) EGR Outlet Temperature Sensor Signal circuit and the EGR Outlet Temperature (K915) Sensor Return circuit at the EGR Outlet Temperature Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the EGR Outlet Temperature Sensor (K935) Signal circuit and the (K915) EGR Outlet Temperature Sensor Return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ABILITY OF THE PCM TO READ THE EGR OUTLET TEMPERATURE SENSOR SIGNAL

1. Install the EGR Outlet Temperature Sensor in accordance with the Service Information.
2. Connect the PCM C2 harness connector.
3. Connect the EGR Outlet Temperature Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, erase PCM DTCs.
6. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
7. Start the engine and let it run for two minutes.
8. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the EGR Outlet Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P040D-00-EGR TEMPERATURE SENSOR 1 CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- When the key is on and battery voltage is above 10.4 Volts.

SET CONDITION

- The PCM detects that the EGR Outlet Temperature circuit voltage is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR OUTLET TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
EGR OUTLET TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
EGR OUTLET TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR OUTLET TEMPERATURE SENSOR (K935) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Outlet Temperature Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary.

3. Turn the ignition on.
4. Measure the voltage on the EGR Outlet Temperature Sensor (K935) Signal circuit at the EGR Outlet Temperature Sensor harness connector.

Is the voltage above 5.2 Volts?

Yes

- Go To [3](#)

No

- Repair the EGR Outlet Temperature Sensor (K935) Signal circuit for a short to voltage.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

3. CHECK THE EGR OUTLET TEMPERATURE SENSOR (K935) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the EGR Outlet Temperature Sensor (K935) Signal circuit between the EGR Outlet Temperature Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the EGR Outlet Temperature Sensor (K935) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE (K915) SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K915) Sensor Return circuit between the EGR Outlet Temperature Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (K915) Sensor Return circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE ABILITY OF THE PCM TO READ THE EGR OUTLET TEMPERATURE SENSOR SIGNAL

1. Install the EGR Outlet Temperature Sensor in accordance with the Service Information.
2. Connect the PCM C2 harness connector.
3. Connect the EGR Outlet Temperature Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, erase PCM DTCs.
6. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
7. Start the engine and let it run for two minutes.
8. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the EGR Outlet Temperature Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P040F-00-EGR TEMPERATURE SENSOR A-B CORRELATION

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Low Pressure (LP) Exhaust Gas Recirculation (EGR) Temperature Sensor has failed a plausibility check ran by the Powertrain Control Module (PCM).

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
LP EGR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) TEMPERATURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Temperature Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty LP EGR Temperature Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P041C-00-EGR TEMPERATURE SENSOR B CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) Temperature Sensor circuitry is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
LP EGR TEMPERATURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K666) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Temperature Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty LP EGR Temperature Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P041D-00-EGR TEMPERATURE SENSOR B CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Outlet Temperature Sensor is a variable resistor sensor and is used to measure the temperature of the EGR gas flow after it exits the EGR Cooler. The EGR temperature sensor is located in the EGR passage, downstream of the EGR valve. The Powertrain Control Module (PCM) supplies 5-Volts to the EGR Temperature Signal circuit. The PCM monitors the change in voltage caused by changes in the resistance of the Sensor to determine the EGR outlet temperature prior to entering the intake manifold.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) Temperature Sensor circuitry is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
LP EGR TEMPERATURE SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE
LP EGR TEMPERATURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) TEMPERATURE SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K932) TEMPERATURE SIGNAL FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. ISOLATE AND CHECK THE LP EGR TEMPERATURE SENSOR (K666) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) TEMPERATURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Temperature Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty LP EGR Temperature Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0420-00-CATALYST EFFICIENCY (BANK 1)

THEORY OF OPERATION

There are three containers along the exhaust bank pipe. Moving from the engine rearward: The first container holds the Diesel Oxidation Catalyst (DOC) and Diesel Particulate Filter (DPF). The DOC is in the front of the container and the DPF is in the rear of the container. Note: This container may only be called the 'Filter, Diesel Particulate' in other portions. The second container down the exhaust bank is the Selective Catalytic Reduction (SCR) Catalyst. The third container is the Muffler. When Diagnostics refer to replacing the DOC, it is referring to the DOC/DPF (or 'Filter, Diesel Particulate'). Not the SCR Catalyst. The DOC calculates the conversion efficiency of raw fuel injected during an active DPF regeneration utilizing the DOC/DPF temperatures.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- This diagnostic runs when the engine is running, and performing an active regeneration of the Aftertreatment Diesel Particulate Filter.

SET CONDITION

- The Powertrain Control Module (PCM) will set the fault if it detects that the Aftertreatment Diesel Oxidation Catalyst (DOC) is not present in the aftertreatment/exhaust system. This code can also set if the conversion of Non-methane Hydro Carbon (NMHC) is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate after two failed consecutive trips.

POSSIBLE CAUSES

Possible Causes
FACE PLUGGING OF THE DOC WITH SOOT
EXHAUST TEMPERATURE SENSORS
AFTERTREATMENT DIESEL OXIDATION CATALYST (DOC) HAS BEEN REMOVED FROM THE VEHICLE
AFTERTREATMENT DIESEL OXIDATION CATALYST (DOC) IS DAMAGED OR NOT FUNCTIONING PROPERLY
DAMAGED DOC, DPF, OR SCR TEMPERATURE SENSORS
IMPROPER FUELING
WIRE HARNESS

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.
2. Check for DTCS related to the Exhaust Temperature sensors, Fueling, or MAF.
3. Check for the following DTCS P0263-00, P0266-00, P0272-00, P0275-00, or P0278-00.

Are any of the systems or DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR THE AFTERTREATMENT DOC MISSING

1. Check the exhaust system to see if the Diesel Oxidation Catalyst (DOC) has been removed.

Is the DOC present in the system?

Yes

- Go To [4](#)

No

- Replace the Diesel Oxidation Catalyst (DOC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR EXHAUST GAS TEMPERATURE SENSOR 2 AND EXHAUST GAS TEMPERATURE SENSOR CATALYST HARNESS CONNECTORS REVERSED

NOTE: Exhaust Gas Temperature Sensor (EGT) 2 is located at the DOC inlet and Exhaust Gas Temperature Sensor (EGT) Catalyst is located at the DOC outlet (Between the DOC and the DPF).

1. Turn the ignition off.
2. Disconnect the EGT 2 harness connector.
3. Turn the ignition on.
4. Using the scan tool, monitor the voltage reading of EGT Sensor 2 and EGT Sensor Catalyst.

Does the Diesel voltage value change to 5.0 volts for EGT Sensor 2 or EGT Sensor Catalyst?

EGT Sensor 2

- Go To [5](#)

EGT Sensor Catalyst

- The harness connectors are reversed. Switch the (EGT 2 and EGT Catalyst) harness connectors to the correct sensors.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK FOR AN EXHAUST LEAK

1. Perform the CHECKING THE EXHAUST SYSTEM FOR LEAKS diagnostic procedure. Refer to [CHECKING THE EXHAUST SYSTEM FOR LEAKS](#) .

Are leaks found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE EXHAUST TEMPERATURE

1. Connect all EGT sensors.
2. Turn the ignition on.
3. Run the engine to normal operating temperature.
4. With the scan tool, read the Exhaust Temperature Sensors to determine the exhaust temperature.

Is the temperature reading above 225Â°F?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. COMPARE THE RATIONALITY OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine.
2. Raise the engine speed to 2500 RPM for two minutes.

Does the temperature readings of all three Exhaust Temperature Sensors change in value at least 5Â°F?

Yes

- Go To [10](#)

No

- Replace the Exhaust Temperature Sensor that did not change in value by at least 5Â°F or is not updating.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK THE OPERATION OF THE EXHAUST TEMPERATURE SENSORS

1. Start the engine and allow it to idle for 10 minutes.
2. With the scan tool, read the values of all three Exhaust Temperature Sensors.

Do all three temperature sensors read above 150Â°F and are the values of the temperature sensors updating?

Yes

- Go To [9](#)

No

- Replace the Exhaust Temperature Sensor that is not above 150Â°F or is not updating on the scan tool.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Were any problems found?

Yes

- Perform the appropriate repair in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK THE CHARGE AIR COOLING (CAC) SYSTEM FOR CONTAMINATION DAMAGING THE AFTERTREATMENT DOC

1. Separate the exhaust plumbing from the Turbocharger outlet.
2. Inspect for signs of oil, coolant or fuel being introduced into the aftertreatment system from the engine or signs of moisture in the Turbocharger exhaust outlet.

Is contamination found in the turbocharger exhaust outlet?

Yes

- Identify and repair the source of the contamination within the engine and replace the Aftertreatment Diesel Oxidation Catalyst (DOC) after the engine failure has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [11](#)

11. CHECK THE AFTERTREATMENT DOC FOR FACE PLUGGING OR BLOCKAGE DUE TO EXCESSIVE SOOT BUILD-UP

1. Remove the Aftertreatment DOC to inspect for damage or presence of face plugging.

Are the components found to be missing, plugged or damaged during the inspection of the Aftertreatment DOC?

Yes

- Replace or repair damaged component(s).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P0426-00-CATALYST TEMPERATURE SENSOR CIRCUIT PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Catalyst Sensor reading is not increasing with engine operating temperature after engine startup.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE CATALYST SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are either of the Exhaust Gas Temperature Catalyst Sensor Low or High DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE EXHAUST GAS TEMPERATURE CATALYST SENSOR OPERATION

1. Remove the Exhaust Gas Temperature Catalyst Sensor and reconnect the harness connector to the sensor. Monitor the scan tool, while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the sensor increase at least 5Â°F on the scan tool?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

No

- Replace the Exhaust Gas Temperature Catalyst Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0427-00-CATALYST TEMPERATURE SENSOR CIRCUIT LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM

illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Catalyst Sensor Signal circuit voltage is below 0.7 Volts for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE CATALYST SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST GAS TEMPERATURE CATALYST SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
EXHAUST GAS TEMPERATURE CATALYST SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE EXHAUST GAS TEMPERATURE CATALYST SENSOR (K372) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Temperature Catalyst Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit at the Exhaust Temperature Catalyst Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE EXHAUST GAS TEMPERATURE CATALYST SENSOR (K372) SIGNAL CIRCUIT FOR A SHORT TO THE (K900) SENSOR GROUND

1. Measure the resistance between the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit and the (K900) Sensor Ground circuit at the Exhaust Gas Temperature Catalyst Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit and the (K900) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE ABILITY OF THE PCM TO READ THE EXHAUST GAS TEMPERATURE CATALYST SENSOR INPUT

1. Connect the Exhaust Gas Temperature Catalyst Sensor harness connector.
2. Connect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off for 75 seconds.
6. Disconnect the Exhaust Gas Temperature Catalyst Sensor harness connector.
7. Turn the ignition on.
8. With the scan tool, read DTCs.

Does the DTC P0428 become active?

Yes

- Replace the Exhaust Gas Temperature Catalyst Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0428-00-CATALYST TEMPERATURE SENSOR CIRCUIT HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. The Catalyst Exhaust Gas Temperature Sensor is located between the Diesel Oxidation Catalyst (DOC) and the Diesel Particulate Filter (DPF). It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the DOC and entering the DPF. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Catalyst Sensor Signal circuit voltage is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE CATALYST SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
EXHAUST GAS TEMPERATURE CATALYST SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE CATALYST SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE EXHAUST GAS TEMPERATURE CATALYST SENSOR (K372) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Temperature Catalyst Sensor harness connector.

NOTE: **Check connectors - Clean/repair as necessary.**

3. Turn the ignition on.
4. Measure the voltage on the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit at the Exhaust Gas Temperature Catalyst Sensor harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE EXHAUST GAS TEMPERATURE CATALYST SENSOR (K372) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the appropriate PCM harness connector.
3. Measure the resistance of the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit between the Exhaust Gas Temperature Catalyst Sensor harness connector and the PCM harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Exhaust Gas Temperature Catalyst Sensor (K372) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K900) Sensor Ground circuit between the Exhaust Gas Temperature Catalyst Sensor harness connector and the appropriate PCM harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (K900) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE EGT CATALYST SENSOR FOR PROPER OPERATION

1. Replace the EGT Catalyst Sensor in accordance with the Service Information.
2. Reconnect the PCM harness connector.
3. Reconnect the EGT Catalyst Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, erase PCM DTCs.
6. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
7. Start the engine and let it run for two minutes.
8. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the Exhaust Gas Temperature (EGT) Catalyst Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P042E-00-EGR A CONTROL STUCK OPEN

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the High Pressure (HP) Exhaust Gas Recirculation (EGR) valve is stuck open.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
HP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE

Possible Causes

HP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
HP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
HIGH PRESSURE (HP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K682) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K684) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K682) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K684) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. REPLACE THE HIGH PRESSURE (HP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the HP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty HP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.

3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P042F-00-EGR A CONTROL STUCK CLOSED

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the High Pressure (HP) Exhaust Gas Recirculation (EGR) valve is stuck closed.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
HP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
HP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
HP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
HP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
HIGH PRESSURE (HP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K682) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K684) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K682) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE HP EGR VALVE ACTUATOR (K684) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. ISOLATE AND CHECK THE HP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. REPLACE THE HIGH PRESSURE (HP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the HP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty HP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P045A-00-EGR B CONTROL CIRCUIT

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) valve circuitry is outside a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
LP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P045B-00-EGR "B" CONTROL CIRCUIT PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) system consists of 4 valves. The High Pressure (HP) EGR Valve works in conjunction with a HP EGR Airflow Control Valve to control exhaust gas entering the Intake Manifold. The Low Pressure (LP) EGR Valve works in conjunction with the LP EGR Airflow Control Valve to control exhaust gas entering the (low pressure) feed to the Turbocharger. The EGR system is designed to facilitate maximum efficiency in blending exhaust gases, fresh air, and charge air.

The exhaust gases from the exhaust pipe downstream of the Diesel Particulate Filter (DPF) travel through an in-line cooler to the LP EGR Valve. The LP EGR Valve is opened to allow the exhaust gases to enter the intake air plumbing upstream of the Turbocharger. The LP EGR Valve mixes exhaust gases and fresh air, which is then introduced to the Turbocharger. The LP EGR Airflow Control Valve (sometimes called 'Intake Flap Valve') serves to control overall fresh air flow into the (low pressure) feed to the Turbocharger. The LP EGR Airflow Control Valve depresses intake air pressure to create a pressure differential, or vacuum across the face of the LP EGR Valve. This enhances the ability of the Intake Air System to recirculate exhaust gases at low speed and load conditions. The LP EGR Airflow Control Valve also reduces intake noise and vibration during idle and engine shut off by closing off fresh air flow.

The exhaust gases from the Exhaust Manifold flow directly to the HP EGR Valve. The HP EGR Valve is opened to allow the exhaust gases to enter the Intake Manifold downstream of the HP EGR Airflow Control Valve. There is a cooler between the HP EGR Valve and the Intake Manifold. An EGR Cooler Bypass Valve is used to divert the exhaust gases around the cooler to increase intake air temperature during cold start engine warm up conditions. The HP EGR Airflow Control Valve depresses intake air pressure to create a pressure differential, or vacuum, across the face of the HP EGR Valve. This enhances the ability of the Intake Air System to recirculate exhaust gases at low speed and load conditions. The HP EGR Airflow Control Valve also reduces intake noise and vibration during idle and engine shut off by closing off fresh air flow.

The LP EGR Valve, HP EGR Valve, and HP EGR Airflow Control Valves are controlled by the Powertrain Control Module (PCM) using H-Bridges that reverses the polarity of the two control circuits connected to a DC motor. The PCM utilizes Pulse Width Modulated (PWM) voltage to control the varying loads on these valves during operation. This helps prevent overheating of the DC motors. Each valve has an integrated position sensor. Each position sensor functions as a typical three wire 5-Volt sensor. The PCM receives feedback from the position sensor signal wire.

The LP EGR Airflow Control Valve has a slightly different architecture. This valve is also controlled by the PCM using a PWM ground on one side of the DC motor. The other side of the DC motor is connected to a constant Fused Ignition feed. The LP EGR Airflow Control Valve is defaulted in the open position meaning that the butterfly valve would be wide open if the PWM ground control or Fused Ignition were removed. The LP EGR Airflow Control Valve also has a position sensor integrated into the housing. But this position sensor functions as a two wire 5-Volt sensor. The PCM determines the position of the butterfly valve by monitoring changes in the 5-Volt Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- LP EGR Valve enabled.

SET CONDITION

- The PCM detects an over temperature condition on the LP EGR Valve Control H-Bridge circuitry for 0.10 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXCESSIVE LP EGR VALVE WINDING TEMPERATURE
LP EGR VALVE ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Start the engine at least twice and allow it to reach normal operating temperature.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle within the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any LP EGR Valve Control circuit or Position Sensor circuit DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. REPLACE THE LP EGR VALVE AND RETEST FOR DTCS

1. Replace the LP EGR Valve in accordance with the Service Information. Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR), REMOVAL AND INSTALLATION** .
2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the LP EGR Valve repaired the condition.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P045C-00-EGR B CONTROL CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) valve circuitry is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO GROUND
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P045D-00-EGR B CONTROL CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) valve circuitry is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO VOLTAGE
LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P045E-00-EGR B CONTROL STUCK OPEN

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) valve is stuck open.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/LOW RESISTANCE
LP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/LOW RESISTANCE
LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
LP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/LOW RESISTANCE

Possible Causes

LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).

4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P0471-00-EXHAUST PRESSURE SENSOR 1 PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) performs a rationality comparison between the Exhaust Pressure Sensor Signal and the Barometric Pressure Sensor. The PCM sets this DTC if the offset is above or below a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0472, P0473, any 5-Volt Supply DTCs, or any Barometric Pressure Sensor active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE EXHAUST PRESSURE SENSOR OPERATION

1. Turn the ignition off.
2. Install the Exhaust Pressure Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, read DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Exhaust Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0472-00-EXHAUST PRESSURE SENSOR 1 LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Exhaust Pressure Sensor Signal is below calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE EXHAUST PRESSURE SENSOR (K373) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Exhaust Pressure Sensor harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the Exhaust Pressure Sensor (K373) Signal circuit at the Exhaust Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Exhaust Pressure Sensor (K373) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE EXHAUST PRESSURE SENSOR OPERATION

1. Install the Exhaust Pressure Sensor in accordance with the Service Information.
2. Connect the Exhaust Pressure Sensor harness connector.
3. Connect the PCM C2 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Start the engine and allow it to reach normal operating temperature.
7. With the scan tool, read DTCs.

Is the DTC Active?

Yes

- Go To [4](#)

No

- Replace the Exhaust Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0473-00-EXHAUST PRESSURE SENSOR 1 HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Exhaust Pressure Sensor Signal is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EXHAUST PRESSURE SENSOR (K373) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Exhaust Pressure Sensor (K373) Signal circuit at the Exhaust Pressure Sensor harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Exhaust Pressure Sensor (K373) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EXHAUST PRESSURE SENSOR (K373) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the Exhaust Pressure Sensor (K373) Signal circuit between the Exhaust Pressure Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Exhaust Pressure Sensor (K373) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE EXHAUST PRESSURE SENSOR OPERATION

1. Install the Exhaust Pressure Sensor in accordance with the Service Information.
2. Connect the Exhaust Pressure Sensor harness connector.
3. Connect the PCM C2 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Start the engine and allow it to reach normal operating temperature.
7. With the scan tool, read DTCs.

Is the DTC Active?

Yes

- Go To [5](#)

No

- Replace the Exhaust Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0476-00-EXHAUST PRESSURE CONTROL VALVE 1 PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Bypass Control Valve position deviation is outside a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS CONTROL VALVE ACTUATOR ROD BINDING/OBSTRUCTED
EXHAUST BYPASS CONTROL VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST BYPASS CONTROL VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
EXHAUST BYPASS CONTROL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR ROD

1. Check for any debris or foreign objects obstructing the path of the Actuator Rod.

Are there any debris or foreign objects obstructing the path of the Actuator Rod?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K675) MOTOR (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K676) MOTOR (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. REPLACE THE EXHAUST BYPASS CONTROL VALVE ACTUATOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Bypass Control Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty Exhaust Bypass Control Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0477-00-EXHAUST PRESSURE CONTROL VALVE A LOW

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Bypass Control Valve position deviation is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS CONTROL VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
EXHAUST BYPASS CONTROL VALVE ACTUATOR (-) CIRCUIT SHORTED TO GROUND
EXHAUST BYPASS CONTROL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K675) MOTOR (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K676) MOTOR (-) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE EXHAUST BYPASS CONTROL VALVE ACTUATOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Bypass Control Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Exhaust Bypass Control Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0478-00-EXHAUST PRESSURE CONTROL VALVE A HIGH

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Bypass Control Valve position deviation is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS CONTROL VALVE ACTUATOR (+) CIRCUIT SHORTED TO VOLTAGE
EXHAUST BYPASS CONTROL VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
EXHAUST BYPASS CONTROL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K675) MOTOR (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS

CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST BYPASS CONTROL VALVE ACTUATOR (K676) MOTOR (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE EXHAUST BYPASS CONTROL VALVE ACTUATOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Bypass Control Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.

5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Exhaust Bypass Control Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P047B-00-EXHAUST PRESSURE SENSOR B CIRCUIT RANGE-PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Pressure Sensor is outside a calibrated range. The PCM looks at this diagnostic at key-on after a complete key-off cycle of 5 minutes or more. The PCM also looks at this diagnostic during acceleration from idle to 20 mph for one minute and from 20 mph to 50 mph for another minute.

DEFAULT ACTION

- The MIL will illuminate after two fails after 2 consecutive drive cycles.

POSSIBLE CAUSES

Possible Causes
SUCTION AT TAIL PIPE (EXHAUST DUMP)
BLOCKAGE IN LP EGR SENSOR TUBES
DISCONNECTED OR DAMAGED LP EGR SENSOR TUBES
SWITCHED HOSES ON LP EGR SENSOR
EXHAUST LEAK
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST PRESSURE SENSOR RETURN CIRCUIT SHORTED TO GROUND
EXHAUST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE EXHAUST SYSTEM

NOTE: This fault can be set during testing if a exhaust suction greater than 10 Hpa was applied to the system.

1. Visually inspect the exhaust for blockage, leaks, damage, or disconnected LP EGR Sensor tubes.

Are there any issues present with the exhaust?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [7](#)

7. REPLACE THE EXHAUST PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty Exhaust Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P047C-00-EXHAUST PRESSURE SENSOR B CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Pressure Sensor is outside a calibrated range. The PCM looks at this diagnostic at key-on after a complete key-off cycle of 5 minutes or more. The PCM also looks at this diagnostic during acceleration from idle to 20 mph for one minute and from 20 mph to 50 mph for another minute.

DEFAULT ACTION

- The MIL will illuminate after two fails after 2 consecutive drive cycles.

POSSIBLE CAUSES

Possible Causes
SUCTION AT TAIL PIPE (EXHAUST DUMP)
BLOCKAGE IN LP EGR SENSOR TUBES
DISCONNECTED OR DAMAGED LP EGR SENSOR TUBES

Possible Causes

SWITCHED HOSES ON LP EGR SENSOR
EXHAUST LEAK
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST PRESSURE SENSOR RETURN CIRCUIT SHORTED TO GROUND
EXHAUST PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK THE EXHAUST SYSTEM

NOTE: This fault can be set during testing if a exhaust suction greater than 10 Hpa was applied to the system.

1. Visually inspect the exhaust for blockage, leaks, damage, or disconnected LP EGR Sensor tubes.

Are there any issues present with the exhaust?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. REPLACE THE EXHAUST PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty Exhaust Pressure Sensor repaired the fault.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), EMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P047D-00-EXHAUST PRESSURE SENSOR B CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the LP EGR Pressure Sensor is outside a calibrated range. The PCM looks at this diagnostic at key-on after a complete key-off cycle of 5 minutes or more. The PCM also looks at this diagnostic during acceleration from idle to 20 mph for one minute and from 20 mph to 50 mph for another minute.

DEFAULT ACTION

- The MIL will illuminate after two fails after 2 consecutive drive cycles.

POSSIBLE CAUSES

Possible Causes
SUCTION AT TAIL PIPE (EXHAUST DUMP) BLOCKAGE IN LP EGR SENSOR TUBES DISCONNECTED OR DAMAGED LP EGR SENSOR TUBES SWITCHED HOSES ON LP EGR SENSOR EXHAUST LEAK EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE EXHAUST PRESSURE SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE EXHAUST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND EXHAUST PRESSURE SENSOR RETURN CIRCUIT SHORTED TO GROUND EXHAUST PRESSURE SENSOR POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#).

2. CHECK THE EXHAUST SYSTEM

NOTE: This fault can be set during testing if a exhaust suction greater than 10 Hpa was applied to the system.

1. Visually inspect the exhaust for blockage, leaks, damage, or disconnected LP EGR Sensor tubes.

Are there any issues present with the exhaust?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

4. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K489) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. ISOLATE AND CHECK THE EXHAUST PRESSURE SENSOR (K952) GROUND CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. REPLACE THE EXHAUST PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.

2. Replace the Exhaust Pressure Sensor in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Replacing the faulty Exhaust Pressure Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P047F-00-EXHAUST PRESSURE CONTROL VALVE A STUCK OPEN

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Pressure Bypass Valve is stuck open.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS VALVE ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST BYPASS VALVE ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST BYPASS VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
EXHAUST BYPASS VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
EXHAUST BYPASS VALVE POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST BYPASS VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
EXHAUST BYPASS VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST BYPASS VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K675) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K676) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K675) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE ACTUATOR (K676) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE POSITION SENSOR (K665) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide

to follow the path of the circuit.

3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE POSITION SENSOR (K665) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE POSITION SENSOR (K665) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [9](#)

9. REPLACE THE EXHAUST BYPASS VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Bypass Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty Exhaust Bypass Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0480-00-COOLING FAN 1 CONTROL CIRCUIT

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Engine Cooling Fan is operated by a Cooling Fan Module. The Cooling Fan Module receives a Pulse-Width Modulated (PWM) signal directly from the Powertrain Control Module (PCM) through a dedicated circuit. This signal varies depending on temperature and other engine inputs to the PCM.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Battery voltage greater than 10.0 volts.

SET CONDITION

- The Powertrain Control Module (PCM) controls the Cooling Fan operation by sending a Pulse-Width Modulated (PWM) signal to the Cooling Fan Module to control fan speed. The PCM determines that the Cooling Fan is not operating.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
COOLING FAN CONTROL CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
COOLING FAN CONTROL MODULE FUSED 12-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
COOLING FAN MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0691 or P0692 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE RADIATOR FAN MODULE FUSED 12-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Cooling Fan Module harness connector.
3. Measure the voltage between ground and the Radiator Fan Module Fused 12-Volt Supply circuit at the Cooling Fan Module harness connector.

Is the voltage less than a direct connection to the Battery (+- 1.0 Volt)?

Yes

- Repair the Radiator Fan Module Fused 12-Volt Supply circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RADIATOR FAN (K173) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the Radiator Fan (K173) Control circuit between the PCM C1 harness connector and the Cooling Fan Module harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Radiator Fan (K173) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P048D-00-EXHAUST PRESSURE CONTROL VALVE A POSITION SENSOR-SWITCH CIRCUIT LOW

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Pressure Bypass Valve Position Signal is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST BYPASS VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .**

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. ISOLATE AND CHECK THE EXHAUST BYPASS VALVE (K665) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. REPLACE THE EXHAUST BYPASS VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P048E-00-EXHAUST PRESSURE CONTROL VALVE A POSITION SENSOR-SWITCH CIRCUIT HIGH

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information .**

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Pressure Bypass Valve Position Signal is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST BYPASS VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
EXHAUST BYPASS VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. **ISOLATE AND CHECK THE EXHAUST BYPASS VALVE (K665) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR**

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. REPLACE THE EXHAUST BYPASS VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To the appropriate information

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P049B-00-EGR B FLOW INSUFFICIENT DETECTED

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- LP EGR flowing.
- Engine coolant temperature above 55°C (131°F).
- Charge air cooler temperature above 6°C (42.8°F).

SET CONDITION

- The Powertrain Control Module detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) flow is less than the commanded threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR DIFFERENTIAL PRESSURE SENSOR FAULT CLOGGED LP EGR COOLER LEAKS OR RESTRICTIONS BETWEEN THE DPF OUTLET AND THE TURBOCHARGER INLET MASS AIR FLOW (MAF) SENSOR FAULT LP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/LOW RESISTANCE LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE LP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/LOW RESISTANCE LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR OTHER DTCS

1. Check for MAF Sensor, Exhaust Flap, LP EGR, and/or Differential Pressure Sensor DTCS.

NOTE: All circuit related DTCS should be addressed be continuing with this DTC.

Are there any MAF Sensor, Exhaust Flap, LP EGR, and/or Differential Pressure Sensor DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.

4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [7](#)

7. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K685) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [11](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P049C-00-EGR B FLOW EXCESSIVE DETECTED

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) flow is greater than the commanded threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LP EGR VALVE ACTUATOR (+) CIRCUIT OPEN/LOW RESISTANCE
LP EGR VALVE ACTUATOR (-) CIRCUIT OPEN/LOW RESISTANCE
LP EGR VALVE ACTUATOR (+) CIRCUIT SHORTED TO GROUND
LP EGR VALVE ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
LP EGR VALVE POSITION SIGNAL CIRCUIT OPEN/LOW RESISTANCE
LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO VOLTAGE
LP EGR VALVE POSITION SIGNAL CIRCUIT SHORTED TO GROUND
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#).

2. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K677) (+) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. ISOLATE AND CHECK THE LP EGR VALVE ACTUATOR (K678) (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. ISOLATE AND CHECK THE LP EGR VALVE POSITION SENSOR (K683) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. REPLACE THE LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the LP EGR Valve in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the faulty LP EGR Valve repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P049D-00-EGR CONTROL POSITION EXCEEDED LEARNING LIMIT

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- In after run mode, during offset learning.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the High Pressure (HP) Exhaust Gas Recirculation (EGR) Valve is not able to be controlled or is sticking.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HP EGR HARNESS CONNECTOR ISSUES
HIGH PRESSURE (HP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any HP EGR circuit related DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE HP EGR HARNESS CONNECTOR

1. Inspect the HP EGR harness connector, PCM harness connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Are there any issues present with the HP EGR or PCM harness connectors?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [4](#)

4. CHECK THE EGR VALVE OPERATION

1. Install the EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs.
4. Cycle the ignition on and off several times, leaving the ignition off for two minutes.
5. Turn the ignition on.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P049E-00-EGR B CONTROL POSITION EXCEEDED LEARNING LIMIT

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- In after run mode, during offset learning.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Low Pressure (LP) Exhaust Gas Recirculation (EGR) Valve is not able to be controlled or is sticking.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW PRESSURE (LP) EXHAUST GAS RECIRCULATION (EGR) VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE LP EGR VALVE OPERATION

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. Cycle the ignition on and off several times, leaving the ignition off for two minutes.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the LP EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P04D8-00-EXCESSIVE TIME TO ENTER CLOSED LOOP EGR CONTROL

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) determines that the EGR control remains in open loop longer than a calibrated amount of time for a given engine speed and load. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER PCM DTCS

1. Turn the ignition on.
2. With the scan tool, read the PCM DTCs.

Are there any Fuel Delivery DTCs, EGR DTCs, or O2 Sensor DTCs present?

Yes

- Perform the Diagnostics for those DTCs before continuing with this one.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P04D9-00-CLOSED LOOP EGR CONTROL AT LIMIT - FLOW TOO LOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on, engine running.

SET CONDITION

- The PCM detects that the deviation between the desired EGR valve position and the actual EGR valve position is less than a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there are any other EGR DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE EGR VALVE OPERATION

1. Turn the ignition off.
2. Install the EGR Valve in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Start the engine and let it run for two minutes.
7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P04DA-00-CLOSED LOOP EGR CONTROL AT LIMIT - FLOW TOO HIGH

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on, engine running.

SET CONDITION

- The PCM detects that the deviation between the desired EGR valve position and the actual EGR valve position is more than a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other EGR DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE EGR VALVE OPERATION

1. Turn the ignition off.
2. Install the EGR Valve in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Start the engine and let it run for two minutes.
7. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P04DB-00-CRANKCASE VENTILATION SYSTEM DISCONNECTED

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The crankcase of the Engine is exposed to small quantities of combustion gases and oil mist leaking during combustion process through the piston ring gap, called blow-by gases. These gases may be an important source of regulated emissions. Therefore a ventilation system is utilized to recycle the blow-by gases from the crankcase into the air duct in a controlled manner.

The Crankcase Pressure Sensor is used to monitor the pressure inside the crankcase. The Powertrain Control Module (PCM) supplies the Crankcase Pressure Sensor a 5-Volt reference voltage. When the crankcase pressure is low, the sensor signal voltage is low. When the crankcase pressure is high, the sensor signal voltage is near the 5-Volt reference voltage. The PCM monitors the Crankcase Pressure Sensor Signal circuit voltage to calculate the pressure of the air within the crankcase.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the Engine running.

SET CONDITION

- The Powertrain Control Module (PCM) compares the Crankcase Pressure Sensor Signal to a calibrated threshold. The PCM sets this DTC if the Crankcase Pressure Sensor Signal is above this threshold for 3.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRANKCASE VENTILATION HOSE DISCONNECTED FROM THE CRANKCASE PORT OR AIR INDUCTION PIPE
RESTRICTION IN THE CRANKCASE VENTILATION HOSE
ENGINE OIL COOLER FAILURE ALLOWING COOLANT TO CONTAMINATE OIL
CRANKCASE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P051B, P051C, P051D, any MAF or CAC (Out) Pressure DTCs, or any 5-Volt Supply DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT THE CRANKCASE VENTILATION HOSE AND ENGINE OIL COOLER FOR LEAKS, RESTRICTIONS, OR OTHER DAMAGE

1. Turn the ignition off.
2. Check hose for any disconnections or loose connections.
3. Remove hose and inspect for any of the following conditions:
 - Signs of leakage in the hose or loose hose connectors.
 - Restriction on the air induction or crankcase connections.
 - Check for mixing of the oil and coolant due to an oil cooler failure.
 - Fluid can be checked by inspecting coolant at the coolant fill cap.

Repair any conditions that are found.

4. Install the hose and verify that it is securely connected.

5. Start Engine and drive the vehicle with moderate-to-heavy acceleration from 0-to-45 MPH.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To

Refer to [4](#).

No

- Repairs to the Crankcase Ventilation Hose or Engine Oil Cooler resolved the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. REPLACE THE CRANKCASE PRESSURE SENSOR AND RETEST FOR DTCS

1. Replace the Crankcase Pressure Sensor in accordance with the Service Information.
2. Connect the component and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Start Engine and drive the vehicle with moderate-to-heavy acceleration from 0-to-45 MPH.
6. Using the previously recorded [Vehicle Scan / Freeze Frame / Environmental Data] and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [5](#)

No

- Replacing the component repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P04DD-00-COLD START EGR 1 FLOW INSUFFICIENT DETECTED

THEORY OF OPERATION

The EGR Airflow Control Valve is a pulse width modulated output, controlled by the Powertrain Control Module (PCM). The EGR Airflow Control Valve is used to control the ratio of fresh air flow to EGR gas air flow. The PCM monitors this ratio with the Mass Air Flow Sensor. The Mass Air Flow Sensor feedback is very prominent in determining the position of the EGR Airflow Control Valve. If the Mass Air Flow Sensor feedback does not match what the PCM is expecting to see when EGR air flow is requested, it can effect the operation of the EGR Valve and the EGR Airflow Control Valve. This can occur if the Mass Air Flow Sensor feedback is faulty or inaccurate, even if no DTCs are actively set. The EGR system and Diesel Particulate Filter regeneration is disabled when the fault is active.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0401-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the SHU mode.

The PCM uses the P04DD-00 monitor when there is an EGR Airflow Control Valve flow-insufficient occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects EGR flow is less than the requested flow for 15.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
INTAKE SYSTEM AIR LEAKS OR RESTRICTIONS
EGR AIR FLOW CONTROL VALVE
EGR SYSTEM LEAKS
EGR COOLER AND TUBES RESTRICTED
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Mass Air Flow Sensor DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT THE AIR FILTER FOR EXCESSIVE DIRT OR DEBRIS

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR A RESTRICTION

1. Visually inspect the fresh air inlet tube for a blockage due to snow, ice or dirt buildup.
2. Visually inspect the intake system, exhaust system and related tubes and connections.

NOTE: Inspect all air intake, crankcase vent and Turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [**INTAKE AIR SYSTEM LEAK DETECTION**](#) .

Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE EGR SYSTEM FOR LEAKS

1. Visually inspect the EGR system for signs of a leak.
2. Look for soot streaks around the valve and connections that would indicate a leak.

Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE EGR AIR FLOW CONTROL VALVE FOR PROPER OPERATION

1. Disconnect the air tube at the inlet port of the EGR Air Flow Control Valve.
2. Use a mirror to observe the motion of the EGR Air Flow Control Valve.
3. Turn the ignition on.
4. The EGR Air Flow Control Valve should open completely without binding with the ignition on.

NOTE: Cycle the ignition on and off several times while observing the operation of the valve.

Did the EGR Air Flow Control Valve operate correctly and without binding?

Yes

- Go To [8](#)

No

- Replace the EGR Air Flow Control Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE EGR COOLER AND TUBES FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive soot build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.

Were any problems found?

Yes

- Clean or replace the EGR Cooler or tubes as necessary.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P04DE-00-COLD START EGR 1 FLOW EXCESSIVE DETECTED

THEORY OF OPERATION

The EGR Airflow Control Valve is a pulse width modulated output, controlled by the Powertrain Control Module (PCM). The EGR Airflow Control Valve is used to control the ratio of fresh air flow to EGR gas air flow. The PCM monitors this ratio with the Mass Air Flow Sensor. The Mass Air Flow Sensor feedback is very prominent in determining the position of the EGR Airflow Control Valve. If the Mass Air Flow Sensor feedback does not match what the PCM is expecting to see when EGR air flow is requested, it can effect the operation of the EGR Valve and the EGR Airflow Control Valve. This can occur if the Mass Air Flow Sensor feedback is faulty or inaccurate, even if no DTCs are actively set. The EGR system and Diesel Particulate Filter regeneration is disabled when the fault is active.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0402-00 monitor when there is an EGR Airflow Control Valve flow-excessive occurrence during the SHU mode.

The PCM uses the P04DE-00 monitor when there is an EGR Airflow Control Valve flow-excessive occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running and ambient temperature above 19.4Â°F (-7Â°C).

SET CONDITION

- The Powertrain Control Module (PCM) detects EGR flow is more than the requested flow for 10.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
INTAKE SYSTEM AIR LEAKS OR RESTRICTIONS
EGR AIR FLOW CONTROL VALVE
EGR COOLER AND TUBES RESTRICTED
EGR VALVE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Mass Air Flow Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT THE AIR FILTER FOR EXCESSIVE DIRT OR DEBRIS

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR A RESTRICTION

1. Visually inspect the fresh air inlet tube for a blockage due to snow, ice or dirt buildup.
2. Visually inspect the intake system, exhaust system and related tubes and connections.

NOTE: Inspect all air intake, crankcase vent and Turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#).

Is there evidence of a leak?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE EGR AIR FLOW CONTROL VALVE FOR PROPER OPERATION

1. Disconnect the air tube at the inlet port of the EGR Air Flow Control Valve.
2. Use a mirror to observe the motion of the EGR Air Flow Control Valve.
3. Turn the ignition on.
4. The EGR Air Flow Control Valve should open completely without binding with the ignition on.

NOTE: Cycle the ignition on and off several times while observing the operation of the valve.

Did the EGR Air Flow Control Valve operate correctly and without binding?

Yes

- Go To [7](#)

No

- Replace the EGR Air Flow Control Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE EGR COOLER AND TUBES FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive soot build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.

Were any problems found?

Yes

- Clean or replace the EGR Cooler or tubes as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the EGR Valve in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0500-00-VEHICLE SPEED SENSOR 1 CIRCUIT

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- The Anti-Lock Brake System (ABS) Module is active.

SET CONDITION

- If the Powertrain Control Module (PCM) receives, via CAN C, an invalid vehicle speed message.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE
CAN C CIRCUIT OPEN CIRCUIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: **Diagnose all CAN B and C communication DTCs before continuing.**

1. Test drive the vehicle
2. With a scan tool, view DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT DTC diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ANTI-LOCK BRAKE MODULE DTCS PRESENT

1. With the scan tool, select view DTCs in the Anti-Lock Brake Module.

Are there any DTCs present in the Anti-lock Brake Module?

Yes

- Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) and perform the appropriate diagnostic procedure.

No

- Go To [3](#)

3. INTERMITTENT VEHICLE SPEED SIGNAL

1. At this time, no DTCs are present.
2. Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
3. Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.
4. Using the schematics as a guide, wiggle test the related circuit(s) while monitoring the scan tool data relative to the vehicle speed sensor circuit(s). Look for the data to change or for a DTC to set.
5. Perform any technical service bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

No

- Test Complete.

P0501-00-VEHICLE SPEED SENSOR 1 PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.,

- With transmission range not in park or neutral.
- The brakes are not applied.
- CAN BUS is active.

SET CONDITION

- The Powertrain Control Module (PCM) receives a CAN message that the vehicle speed signal is implausible or incorrect.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
IMPROPER TIRE INFLATION
TIRE SIZES DO NOT MATCH
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Anti-lock Brake Module-related DTCs or any CAN BUS Communication DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To **3**

3. VISUALLY INSPECT THE TIRES

1. Turn the ignition off.
2. Check the tire sizes to ensure that they are all the same.
3. Check the tires for excessive wear and proper tire pressure.

NOTE: **This code can set due to the front or rear wheels being on a slippery surface while the opposite tires are not.**

4. Notify the customer and ask what the road and driving conditions were like when the fault set.

Were any problems found?

Yes

- Repair as necessary. If the code set during a front or rear wheel spin condition, no repair is necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **4**

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0506-00-IDLE SPEED PERFORMANCE LOWER THAN EXPECTED

For a complete FUEL DELIVERY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The Powertrain Control Module (PCM) meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

The PCM monitors the idle fuel control system using two separate monitors. The first monitor will detect a failure if the idle control system cannot achieve or maintain the target idle speed (rpm's) within a calibrated tolerance. The second monitor will detect a failure if the idle control system cannot achieve the target idle speed with a fuel injection quantity within a calibrated tolerance. The injection quantity tolerance is a calibrated percentage of the normal injection quantity depending on engine speed, coolant temperature and selected transmission gear (i.e. park / neutral or drive / reverse).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running at idle.

SET CONDITION

- Engine speed is consistently lower than a calibrated threshold for 10.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MECHANICALLY DAMAGED ENGINE ACCESSORIES
SEVERE INTAKE SYSTEM RESTRICTIONS
PLUGGED EXHAUST SYSTEM
TRANSMISSION IMPROPERLY LOCKING TORQUE CONVERTER
FAULTY FUEL SYSTEM

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ENGINE ACCESSORIES

1. Visually inspect the engine accessories for damage, binding or dragging.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Transmission DTCs present involving the Torque Converter or lock up operation, or Intake Air System DTCs, or Fuel Delivery DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To **4**

4. CHECK THE INTAKE SYSTEM FOR A RESTRICTION

1. Visually inspect the entire Intake System for a restriction.

Were any restrictions found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **5**

5. CHECK THE EXHAUST SYSTEM FOR A RESTRICTION

1. Visually inspect the entire Exhaust System for a restriction.

Were any restrictions found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **6**

6. CHECK THE FUEL DELIVERY SYSTEM

1. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** and perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure.

Were any problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P0507-00-IDLE SPEED PERFORMANCE HIGHER THAN EXPECTED

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The Powertrain Control Module (PCM) meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

The PCM monitors the idle fuel control system using two separate monitors. The first monitor will detect a failure if the idle control system cannot achieve or maintain the target idle speed (rpm's) within a calibrated tolerance. The second monitor will detect a failure if the idle control system cannot achieve the target idle speed with a fuel injection quantity within a calibrated tolerance. The injection quantity tolerance is a calibrated percentage of the normal injection quantity depending on engine speed, coolant temperature and selected transmission gear (i.e. park / neutral or drive / reverse).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine at idle.

SET CONDITION

- Engine speed is consistently higher than a calibrated threshold for 10.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE AIR LEAK
LEAKING FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Fuel Quantity, Fuel Rail Pressure, EGR, or Intake Air related DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR A LEAKING FUEL INJECTOR

NOTE: Performing the (scan tool) Injector Quantity Correction test will isolate a leaking Injector.

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#) .

Do any Injectors indicate a problem?

Yes

- Replace the Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE INTAKE AIR SYSTEM

1. Perform the INTAKE AIR SYSTEM PRESSURE TEST diagnostic procedure. Refer to the appropriate information.

Were any Intake Air System problems found?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P050E-00-COLD START ENGINE EXHAUST TEMPERATURE TOO LOW

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The diagnostic runs during a certain cold start time period with the Engine running and the Transmission in gear. The diagnostic stops running when the Transmission is shifted into Neutral or Park. The Powertrain Control Module (PCM) determines time duration of the cold start monitor based on calibrated thresholds of temperature sensor inputs. The temp sensor inputs are Engine Coolant (ECT) and Ambient Air (AAT).

SET CONDITION

- The PCM will set this fault if it detects that the actual exhaust energy is unable to reach the target exhaust energy within a pre-determined amount of time during cold starts.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AFTERTREATMENT, FUEL INJECTION, TURBOCHARGER, OR INTAKE AIR RELATED DTCS PRESENT
LEAKS IN THE EXHAUST SYSTEM BETWEEN THE EXHAUST MANIFOLD AND THE TURBOCHARGER
EXHAUST GAS TEMPERATURE (EGT) 1/1 SENSOR
FUEL QUALITY/CONTAMINATION
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Using the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
3. With the scan tool, erase all DTCS.
4. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
7. Using the scan tool, read DTCS.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Ignition on, engine not running.
2. With the scan tool, read DTCS.
3. Save the Vehicle Scan Report and all recorded data.

Are there any other Aftertreatment, Fuel Injection Control System, Turbocharger, or Intake Air System DTCS present?

Yes

- Perform the Diagnostics for any other DTCs present before continuing with this one.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. INSPECT THE EXHAUST SYSTEM FOR LEAKS AT THE CONNECTIONS BETWEEN THE TURBOCHARGER AND THE EXHAUST MANIFOLD

1. Inspect the Exhaust System for leaks at the connections between the Turbocharger and the Exhaust Manifold. Perform the CHECKING THE EXHAUST SYSTEM FOR LEAKS diagnostic procedure. Refer to [CHECKING THE EXHAUST SYSTEM FOR LEAKS](#) .

Were any exhaust leaks found at the connections between the Turbocharger and the Exhaust Manifold?

Yes

- Repair the Exhaust System leak found at the connections between the Turbocharger and the Exhaust Manifold.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE RATIONALITY OF THE EGT SENSORS

NOTE: This Test Step is a cold-soak rationality procedure. The test requires that the engine be turned off for at least 8 hours.

1. Allow the engine to cool off for at least 8 hours.
2. Turn the ignition on, engine off.
3. Using the scan tool, select the four EGT Sensor values: EGT 1/1 ('Turbine Temp'), EGT 1/2 ('Outlet Pre-Cat'), EGT Catalyst ('Inlet DPF'), and EGT 1/3 ('Upstream SCR').
4. Compare the EGT 1/1 to the other three selected.

Is the EGT 1/1 Sensor reading within 6Â°C (11Â°F) of the other three sensors?

Yes

- Go To [5](#)

No

- Replace the Exhaust Gas Temperature (EGT) 1/1 Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE FUEL QUALITY/CONTAMINATION

1. Perform the Diesel Fuel System Contamination procedure. Refer to [FUEL SYSTEM](#) .

Were any problems found?

Yes

- Repair as needed according to the Diesel Fuel Cleanup portion of the Contamination test procedure.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0512-00-STARTER REQUEST CIRCUIT

THEORY OF OPERATION

The Powertrain Control Module (PCM) controls the Starter Motor operation with the Starter Relay. The PCM controls the Starter Relay Control using a High Side Driver (HSD). One side of the Starter Relay coil is connected to ground. The PCM sends voltage along the other side of the coil, along the Starter Relay Control circuit, which then energizes the coil. The relay then passes B+ voltage onward to engage the Starter Motor. The PCM internal diagnostic monitors only the Starter Control circuit for an open circuit, short to ground and short to voltage.

NO TITLE

T

WHEN MONITORED

With the ignition on in the run position.

SET CONDITION

The BCM detects voltage on the Start-Stop Relay Control circuit when the ignition is NOT in the start position.

POSSIBLE CAUSES

Possible Causes
START-STOP RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
BODY CONTROL MODULE (BCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

NOTE: This DTC can set by holding the ignition switch in the start position after the engine starts.

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**TESTING FOR AN INTERMITTENT CONDITION**](#).

2. CHECK THE START-STOP RELAY (K88) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Using a test light, back probe the Start-Stop Relay (K88) Control circuit at the appropriate Power Distribution Center (PDC) harness connector.
3. Turn the ignition to the on position, Engine NOT running.

NOTE: When the ignition is NOT in the Start position, there should be no voltage present at the Start-Stop Relay (K88) Control circuit.

Does the test light illuminate indicating voltage is present?

Yes

- Repair the Start-Stop Relay (K88) Control circuit for a short to voltage.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all BCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all BCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Freeze Frame and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Replace and program the Body Control Module (BCM) in accordance with the Service Information. Refer to [MODULE, BODY CONTROL \(BCM\), REMOVAL AND INSTALLATION](#).
- Perform the BODY CONTROL MODULE VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the BODY CONTROL MODULE VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#).

P0513-00-INVALID SKIM KEY

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an invalid Secret key. One Trip Fault.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
INCORRECT VIN PROGRAMMED IN THE PCM
NO VIN PROGRAMMED IN THE PCM
IGNITION KEY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any RF HUB DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. VERIFY THE PROPER VIN IS PROGRAMMED INTO THE PCM

1. With the scan tool, display the VIN that is programmed into the PCM.

Has the correct VIN been programmed into the PCM?

Yes

- Go To [4](#)

No

- Program the correct VIN into the PCM and retest. If the code return Go To [4](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. VERIFY THE PROPER VIN IS PROGRAMMED INTO THE RF HUB

1. With the scan tool, display the VIN that is programmed into the PCM.

has the correct VIN been programmed in the RF HUB?

Yes

- Replace the faulty Ignition Key

NOTE: **You must obtain the Secret Key pin number**

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- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Reprogram the correct VIN into the RF HUB and retest. If the code return Go To Refer to [5](#).

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. PERFORM THE PCM REPLACED PROCEDURE

1. Perform the REPLACE PCM PROCEDURE. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), ODULE PROGRAMMING](#) .
2. With the scan tool, erase all DTCs.
3. Turn the ignition off for a minimum of 10.0 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

Did the DTC return?

Yes

- You must obtain the Secret Key pin number
- Replace the faulty Ignition Key and retest. If the code returns. Go To [6](#)
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The procedure repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0516-00-BATTERY TEMPERATURE SENSOR CIRCUIT LOW

WHEN MONITORED

- The Intelligent Battery Sensor (IBS) monitors the Battery voltage, temperature, and state of charge.

SET CONDITION

- The IBS is reporting that the Battery temperature value is below a calibrated threshold during any of the transition periods.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTELLIGENT BATTERY SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, create a Vehicle Scan Report and attach it to the repair order.

NOTE: Diagnose any CAN - C Communication DTCs before continuing.

NOTE: Diagnose any battery or charging system faults before continuing.

3. With the scan tool, read the Powertrain Control Module (PCM) DTCs.

Is the DTC active?

Yes

- Replace the Intelligent Battery Sensor in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P051B-00-CRANKCASE PRESSURE SENSOR CIRCUIT PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The crankcase of the Engine is exposed to small quantities of combustion gases and oil mist leaking during combustion process through the piston ring gap, called blow-by gases. These gases may be an important source of regulated emissions. Therefore a ventilation system is utilized to recycle the blow-by gases from the crankcase into the air duct in a controlled manner.

The Crankcase Pressure Sensor is used to monitor the pressure inside the crankcase. The Powertrain Control Module (PCM) supplies the Crankcase Pressure Sensor a 5-Volt reference voltage. When the crankcase pressure is low, the sensor signal voltage is low. When the crankcase pressure is high, the sensor signal voltage is near the 5-Volt reference voltage. The PCM monitors the Crankcase Pressure Sensor Signal circuit voltage to calculate the pressure of the air within the crankcase.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Crankcase Pressure Sensor Signal is above or below a calibrated threshold for calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRANKCASE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P051C-00, P051D-00, r any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. REPLACE THE CRANKCASE PRESSURE SENSOR AND CHECK FOR DTCS

1. Turn the ignition off.
2. Replace the Crankcase Pressure Sensor in accordance with the Service Information.
3. Turn the ignition on, Engine not running.
4. Using the scan tool, erase all PCM DTCs.
5. Start the engine and allow it to reach normal operating temperature.
6. Shut off the Engine, and turn the ignition off for 60 seconds.
7. Turn the ignition on, Engine off.
8. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [4](#)

No

- Replacing the Crankcase Pressure Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P051C-00-CRANKCASE PRESSURE SENSOR CIRCUIT LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Crankcase Pressure Sensor Signal is below 0.25 Volts for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRANKCASE PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CRANKCASE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#) Refer to [2](#).

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE CRANKCASE PRESSURE SENSOR (K302) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Crankcase Pressure Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the Crankcase Pressure Sensor (K302) Signal circuit at the Crankcase Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Crankcase Pressure Sensor (K302) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE CRANKCASE PRESSURE SENSOR (K302) SIGNAL CIRCUIT FOR A SHORT TO THE (K936) SENSOR RETURN

1. Measure the resistance between the Crankcase Pressure Sensor (K302) Signal circuit and the (K936) Sensor Return circuit at the Crankcase Pressure Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the short between the Crankcase Pressure Sensor (K302) Signal circuit and the (K936) Sensor Return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE CRANKCASE PRESSURE SENSOR OPERATION

1. Install the Crankcase Pressure Sensor in accordance with the Service Information.
2. Connect the Crankcase Pressure Sensor harness connector.
3. Connect the PCM C1 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Start the engine and allow it to reach normal operating temperature.
7. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Crankcase Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P051D-00-CRANKCASE PRESSURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Crankcase Pressure Sensor Signal is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRANKCASE PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CRANKCASE PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
CRANKCASE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE CRANKCASE PRESSURE SENSOR (K302) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Crankcase Pressure Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage between ground and the Crankcase Pressure Sensor (K302) Signal circuit at the Crankcase Pressure Sensor harness connector.

Is the voltage above 5.2 volts?

Yes

- Repair the Crankcase Pressure Sensor (K302) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE CRANKCASE PRESSURE SENSOR (K302) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Crankcase Pressure Sensor (K302) Signal circuit between the Crankcase Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the Crankcase Pressure Sensor (K302) Signal circuit for an open/high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE CRANKCASE PRESSURE SENSOR OPERATION

1. Install the Crankcase Pressure Sensor in accordance with the Service Information.
2. Connect the Crankcase Pressure Sensor harness connector.
3. Connect the PCM C1 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Start the engine and allow it to reach normal operating temperature.
7. With the scan tool, read DTCs.

Is the DTC active?

Yes

- Go To [5](#)

No

- Replace the Crankcase Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0521-00-ENGINE OIL PRESSURE SENSOR PERFORMANCE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Oil Pressure Sensor Signal circuit is above the calibrated threshold for 0.05 second.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
OIL PRESSURE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
OIL PRESSURE SWITCH
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE ENGINE OIL/ENGINE MECHANICAL CONDITION

NOTE: **Make sure that the engine oil is at the proper level. Also, review the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.**

1. The following items should be considered before determining the cause of this DTC. Failure to do so may lead to misdiagnosis.
 - LOW ENGINE OIL
 - ENGINE OIL PRESSURE BELOW SPECIFICATION
 - ENGINE MECHANICAL TOLERANCES OUT OF SPECIFICATION
 - DETERIORATED OR DIRTY OIL
 - ENGINE OIL CONTAMINATED (i.e., coolant and/or fuel)

NOTE: **If any of the above conditions are found, repair as necessary.**

Were any of the above conditions present?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE OIL PRESSURE SWITCH (G6) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Oil Pressure Switch harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the Oil Pressure Switch (G6) Signal circuit at the Oil Pressure Switch harness connector.

Does the resistance measure above 10k Ohms?

Yes

- Repair the Oil Pressure Switch (G6) Signal circuit for a short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE OIL PRESSURE SWITCH (G6) SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Oil Pressure Switch (G6) Signal between the Oil Pressure Switch harness connector and the PCM C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Oil Pressure Switch (G6) Signal for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE OIL PRESSURE SWITCH OPERATION

1. Install the Oil Pressure Switch in accordance with the Service Information.
2. Connect the PCM C2 harness connector.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine.
5. Monitor the scan tool for at least two minutes.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replace the Oil Pressure Switch in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0522-00-ENGINE OIL PRESSURE SENSOR-SWITCH A LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Engine Oil Temperature (EOT) Sensor is incorporated into the Engine Oil Pressure (EOP) Sensor. The EOP Sensor provides both a pressure and temperature signal feedback to the Powertrain Control Module (PCM). The sensors share the common sensor ground circuit but the 5-Volt supply circuit is only used for the internal pressure sensor.

The EOT Sensor is a variable resistor that operates as a typical two wire sensor. The Powertrain Control Module (PCM) supplies the sensor with a 5-Volt signal and the shared sensor ground circuit. For the EOT Sensor diagnostic, the PCM internally monitors the voltage on the signal circuit, which is converted into a temperature reading. When the oil temperature is low, the sensor resistance is high. When the oil temperature is high, the sensor resistance is low.

The EOP Sensor is a variable resistor that operates as a typical three wire sensor. The PCM provides a 5-Volt supply to the EOP Sensor on the 5-Volt supply and the shared sensor ground. The Engine Oil Pressure Sensor signal can be a pull up (5.0 volts) or pull down (0.0 volts) resistor depending on the PCM internal hardware for the signal circuit. This can vary between vehicles and model years. The PCM manages the information received by the EOP sensor with specific strategies that may lead to an Instrument Cluster oil lamp switched ON in particular conditions. The strategy is based on the expected pressure based on engine working condition and oil temperature of the oil prescribed in the Owner's Manual. This strategy includes a buffer in cold conditions or at key on to prevent misdiagnosis. This strategy keeps the oil lamp switched ON for the entire driving cycle in

when the oil pressure is detected below the calibrated threshold, even if the oil pressure is returns to normal. The lamp is re-initialized (switched off) in the following driving cycle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Engine Oil Pressure (EOP) Sensor signal value is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EOP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
EOP PRESSURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EOP PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
ENGINE OIL PRESSURE (EOP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

- 2. ISOLATE AND CHECK THE EOP SENSOR (K110) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND**

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EOP SENSOR (G6) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. ISOLATE AND CHECK THE EOP SENSOR (G6) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO THE (G924) SENSOR GROUND CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE ENGINE OIL PRESSURE (EOP) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P0523-00 To P0628-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P0523-00-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Engine Oil Temperature (EOT) Sensor is incorporated into the Engine Oil Pressure (EOP) Sensor. The EOP Sensor provides both a pressure and temperature signal feedback to the Powertrain Control Module (PCM). The sensors share the common sensor ground circuit but the 5-Volt supply circuit is only used for the internal pressure sensor.

The EOT Sensor is a variable resistor that operates as a typical two wire sensor. The Powertrain Control Module (PCM) supplies the sensor with a 5-Volt signal and the shared sensor ground circuit. For the EOT Sensor diagnostic, the PCM internally monitors the voltage on the signal circuit, which is converted into a temperature reading. When the oil temperature is low, the sensor resistance is high. When the oil temperature is high, the sensor resistance is low.

The EOP Sensor is a variable resistor that operates as a typical three wire sensor. The PCM provides a 5-Volt supply to the EOP Sensor on the 5-Volt supply and the shared sensor ground. The Engine Oil Pressure Sensor signal can be a pull up (5.0 volts) or pull down (0.0 volts) resistor depending on the PCM internal hardware for the signal circuit. This can vary between vehicles and model years. The PCM manages the information received by the EOP sensor with specific strategies that may lead to an Instrument Cluster oil lamp switched ON in particular conditions. The strategy is based on the expected pressure based on engine working condition and oil temperature of the oil prescribed in the Owner's Manual. This strategy includes a buffer in cold conditions or at key on to prevent misdiagnosis. This strategy keeps the oil lamp switched ON for the entire driving cycle in when the oil pressure is detected below the calibrated threshold, even if the oil pressure is returns to normal. The lamp is re-initialized (switched off) in the following driving cycle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Engine Oil Pressure signal circuit is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EOP 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
EOP PRESSURE SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. ISOLATE AND CHECK THE EOP SENSOR (K110) 5-VOLT SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EOP SENSOR (G6) PRESSURE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE (G924) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. REPLACE THE ENGINE OIL PRESSURE (EOP) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0524-00-ENGINE OIL PRESSURE TOO LOW

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Engine Oil Temperature (EOT) Sensor is incorporated into the Engine Oil Pressure (EOP) Sensor. The EOP Sensor provides both a pressure and temperature signal feedback to the Powertrain Control Module (PCM). The sensors share the common sensor ground circuit but the 5-Volt supply circuit is only used for the internal pressure sensor.

The EOT Sensor is a variable resistor that operates as a typical two wire sensor. The Powertrain Control Module (PCM) supplies the sensor with a 5-Volt signal and the shared sensor ground circuit. For the EOT Sensor diagnostic, the PCM internally monitors the voltage on the signal circuit, which is converted into a temperature reading. When the oil temperature is low, the sensor resistance is high. When the oil temperature is high, the sensor resistance is low.

The EOP Sensor is a variable resistor that operates as a typical three wire sensor. The PCM provides a 5-Volt supply to the EOP Sensor on the 5-Volt supply and the shared sensor ground. The Engine Oil Pressure Sensor signal can be a pull up (5.0 volts) or pull down (0.0 volts) resistor depending on the PCM internal hardware for the signal circuit. This can vary between vehicles and model years. The PCM manages the information received by the EOP sensor with specific strategies that may lead to an Instrument Cluster oil lamp switched ON in particular conditions. The strategy is based on the expected pressure based on engine working condition and oil temperature of the oil prescribed in the Owner's Manual. This strategy includes a buffer in cold conditions or at key on to prevent misdiagnosis. This strategy keeps the oil lamp switched ON for the entire driving cycle in when the oil pressure is detected below the calibrated threshold, even if the oil pressure is returns to normal. The lamp is re-initialized (switched off) in the following driving cycle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine cranking.
- With the engine running.

SET CONDITION

- The PCM detects that minimum required engine oil pressure has not been met over a calibrated amount of time during cranking or normal engine operation.

NOTE: **The Threshold for this DTC is based on engine oil type and the temperature of the oil.**

•

DEFAULT ACTION

- The Oil Lamp will illuminate. The lamp will remain illuminated for the entire drive cycle.

POSSIBLE CAUSES

Possible Causes
OIL FILTER NOT COMPLETELY TIGHTENED
OIL DETERIORATED OVER TIME / DIRTY OIL / OIL NOT CHANGED IN ACCORDANCE WITH INSTRUMENT CLUSTER REQUEST
INCORRECT ENGINE OIL

Possible Causes

LOW ENGINE OIL LEVEL / OPERATING CONDITIONS ON SLOPES OR INCLINES WITH LOW ENGINE OIL LEVEL
EOP PRESSURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ENGINE OIL PRESSURE (EOP) SENSOR
ENGINE MECHANICAL ISSUE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

NOTE: If the DTC does not return the engine oil should still be checked. Refer to step two for guidance, but do not proceed further if no issues are found.

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK THE ENGINE OIL

1. Turn the ignition off.
2. Check the engine oil for proper level and also look for any contaminants.
3. Check for an incorrectly installed engine oil filter, deteriorated engine oil due to excessive heat from cylinder blow-by, or engine oil with the wrong viscosity.

Where there any issues found with the engine oil?

Yes

- Change the engine oil with the specified engine oil type in accordance with the Service Information and Owner's Manual.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EOP SENSOR (G6) PRESSURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE (G924) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. REPLACE THE ENGINE OIL PRESSURE (EOP) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE ENGINE FOR MECHANICAL ISSUES

1. Inspect the engine for the following issues:
 - Abnormal engine noise, especially in the area of the oil pump. Refer to the Service Information for engine oil pump location.
 - Recent evidence of an injector replacement. If an injector has been replaced incorrectly it may cause the engine oil pickup to become clogged due to excessive heat from cylinder blow-by. If the sealing between injector and cylinder head is not good some blow-by gas may enter under the camshaft cover adding excessive heat to the oil.
 - Oil circuit / bearings issues. Check for metallic debris into the oil filter cartridge and oil drained from the oil sump. Then remove the oil sump in accordance with the Service Information and verify the internal parts of the engine are not worn.
2. Next, inspect the engine for the following (**UNLIKELY**) issues:
 - Oil draining valve in the filter not working properly. Check the valve for unrestricted flow.
 - Severely diluted oil from fuel due to High pressure fuel pump sealing issue. Dismount the High pressure fuel pump in accordance with the Service Information and verify the sealing. Then check for possible obstruction in the fuel return line from the pump to the tank.

Where there any mechanical issues found with the engine?

Yes

- Perform the appropriate repair in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P052F-00-GLOW PLUG CONTROL MODULE 1 SYSTEM VOLTAGE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Glow Plug Control Module reports a power supply circuit fault to the Powertrain Control Module (PCM).

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE GROUND CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Glow Plug Module C1 harness connector.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the (F343) Fused ASD Relay Output circuit at the Glow Plug Module C1 harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F343) Fused ASD/Main Relay Output circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (A29) FUSED B+ CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Using a 12-volt test light connected to ground, probe the (A29) Fused B+ circuit at the Glow Plug Module harness connector.

NOTE: **The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.**

Is the test light illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (Z909) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Using a 12-volt test light connected to B+, probe the (Z909) Ground circuit at the Glow Plug Module harness connector.

NOTE: **The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.**

Is the test light illuminated and bright?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the (Z909) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0532-00-A/C PRESSURE SENSOR CIRCUIT LOW

For a complete A/C CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) receives various information from the operator controls and engine sensor inputs to determine when the A/C Compressor Clutch should be turned on. The A/C Pressure Sensor information is a direct input to the PCM. You will not receive a MIL lamp for this fault, but the customer may complain of poor A/C performance.

WHEN MONITORED

This diagnostic runs one time during an ignition cycle when the following conditions are met:

- With the ignition on.

SET CONDITION

- The PCM detects that the A/C Pressure Sensor Signal circuit voltage is below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO THE A/C PRESSURE SENSOR RETURN
A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
A/C PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE A/C PRESSURE SENSOR (C18) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the A/C Pressure Sensor harness connector.
3. Disconnect the PCM C1 harness connector.

NOTE: **Check connectors - Clean/repair as necessary.**

4. Measure the resistance between ground and the A/C Pressure Sensor (C18) Signal circuit at the A/C Pressure Sensor harness connector.

Is the resistance below 10k Ohms?

Yes

- Repair the A/C Pressure Sensor (C18) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **3**

3. CHECK FOR THE A/C PRESSURE SENSOR (C18) SIGNAL CIRCUIT SHORTED TO THE (C918) SENSOR RETURN

1. Measure the resistance between the A/C Pressure Sensor (C18) Signal circuit and the (C918) Sensor Return circuit at the A/C Pressure Sensor harness connector.

Is the resistance below 10k Ohms?

Yes

- Repair the short between the A/C Pressure Sensor (C18) Signal circuit and the (C918) Sensor Return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE A/C PRESSURE SENSOR (C18) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the A/C Pressure Sensor (C18) Signal circuit between the A/C Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To **5**

No

- Repair the A/C Pressure Sensor (C18) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE ABILITY OF THE PCM TO READ THE A/C PRESSURE SENSOR SIGNAL

1. Connect the PCM C1 harness connector.
2. Turn the ignition on.
3. With the scan tool, record all Freeze frame data.
4. With the scan tool, erase DTCs.
5. Turn the ignition off for 75 seconds.
6. Turn the ignition on.
7. While monitoring the scan tool, use a jumper wire to connect the (C818) 5-Volt Supply circuit to the A/C Pressure Sensor (C18) Signal circuit at the A/C Pressure Sensor harness connector.

Did P0533 set?

Yes

- Replace the A/C Pressure Sensor.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0533-00-A/C PRESSURE SENSOR CIRCUIT HIGH

For a complete A/C CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) receives various information from the operator controls and engine sensor inputs to determine when the A/C Compressor Clutch should be turned on. The A/C Pressure Sensor information is a direct input to the PCM. You will not receive a MIL lamp for this fault, but the customer may complain of poor A/C performance.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the A/C Pressure Sensor Signal circuit voltage is above a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
A/C PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE (C918) SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Disconnect the A/C Pressure Sensor harness connector.
4. Measure the resistance of the (C918) Sensor Return circuit between the A/C Pressure Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (C918) Sensor Return circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE A/C PRESSURE SENSOR (C18) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Connect the PCM C1 harness connector.
2. Turn the ignition on.
3. Measure the voltage on the (C18) Signal circuit at the A/C Pressure Sensor harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the A/C Pressure Sensor (C18) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE ABILITY OF THE PCM TO READ THE A/C PRESSURE SENSOR SIGNAL

1. Turn the ignition off.
2. Connect the A/C Pressure Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, record all Freeze frame data.
5. With the scan tool, erase DTCs.
6. Turn the ignition off for 75 seconds.
7. Disconnect the A/C Pressure Sensor harness connector.
8. Turn the ignition on.
9. While monitoring scan tool, use a jumper wire to connect the (C918) Sensor Return circuit to the A/C Pressure Sensor (C18) Signal circuit at the A/C Pressure Sensor harness connector.

Did P0532 set?

Yes

- Replace the A/C Pressure Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P053A-00-CRANKCASE VENT HEATER CONTROL CIRCUIT OPEN

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the Crankcase Vent Heater command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Crankcase Vent Heater Control circuit open for 0.5 second.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CRANKCASE VENT HEATER CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
CRANKCASE VENT HEATER
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.

2. Disconnect the Crankcase Vent Heater harness connector.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the (F343) Fused ASD Relay Output circuit at the Crankcase Vent Heater harness connector.

NOTE: **The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.**

Is the test light illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F343) Fused ASD Relay Output circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE CRANKCASE VENT HEATER (N116) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the Crankcase Vent Heater (N116) Control circuit between the Crankcase Vent Heater harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Crankcase Vent Heater (N116) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE ABILITY OF THE PCM TO OPERATE THE CRANKCASE VENT HEATER CONTROL

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Connect a jumper between the Crankcase Vent Heater (N116) Control circuit and the (F343) Fused ASD Relay Output circuit at the Crankcase Vent Heater harness connector.
4. Turn the ignition on.
5. Start the engine and allow it to idle.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

NOTE: **The P053C-Crankcase Vent Heater Control Circuit High DTC should be active or pending with the jumper in place.**

Did P053C-Crankcase Vent Heater Control Circuit High DTC display as active?

Yes

- Replace the Crankcase Vent Heater.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Crankcase Vent Heater Control circuit is shorted to ground for 0.5 second.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CRANKCASE VENT HEATER CONTROL CIRCUIT SHORTED TO GROUND
CRANKCASE VENT HEATER
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE CRANKCASE VENT HEATER (N116) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Crankcase Vent Heater harness connector.
3. Disconnect the PCM C1 harness connector.

4. Measure the resistance between ground and the Crankcase Vent Heater Control (N116) circuit in the Crankcase Vent Heater harness connector.

Is the resistance below 10k Ohms?

Yes

- Repair the Crankcase Vent Heater Control (N116) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO OPERATE CRANKCASE VENT HEATER CONTROL

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Connect a jumper between the Crankcase Vent Heater (N116) Control circuit and the (F343) Fused ASD Relay Output circuit at the Crankcase Vent Heater harness connector.
4. Turn the ignition on.
5. Start the engine and allow it to idle.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, read DTCs.

NOTE: The P053C-Crankcase Vent Heater Control Circuit High DTC should be active or pending with the jumper in place.

Did P053C-Crankcase Vent Heater Control Circuit High DTC display as active?

Yes

- Replace the Crankcase Vent Heater.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P053C-00-CRANKCASE VENT HEATER CONTROL CIRCUIT HIGH

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the Crankcase Vent Heater command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the (N116) Crankcase Vent Heater Control circuit is shorted to voltage for 10.0 seconds.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CRANKCASE VENT HEATER CONTROL CIRCUIT SHORTED TO VOLTAGE
CRANKCASE VENT HEATER CONTROL CIRCUIT SHORTED TO THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT

Possible Causes
CRANKCASE VENT HEATER
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE CRANKCASE VENT HEATER (N116) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Crankcase Vent Heater harness connector.
3. Disconnect the PCM C1 harness connector.
4. Remove the ASD Relay.
5. Connect a jumper between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage on the Crankcase Vent Heater (N116) Control circuit at the Crankcase Vent Heater harness connector.

Is there any voltage present?

Yes

- Repair the Crankcase Vent Heater (N116) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK FOR THE CRANKCASE VENT HEATER (N116) CONTROL CIRCUIT SHORTED TO THE (F343) FUSED ASD RELAY OUTPUT CIRCUIT

1. Turn the ignition off.
2. Remove the jumper and install the ASD relay.
3. Measure the resistance between the Crankcase Vent Heater (N116) Control circuit and the (F343) Fused ASD Relay Output circuit at the Crankcase Vent Heater harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Crankcase Vent Heater (N116) Control circuit for a short to the (F343) Fused ASD Relay Output circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ABILITY OF THE PCM TO OPERATE CRANKCASE VENT HEATER CONTROL

1. Turn the ignition off.
2. Connect the PCM C1 harness connector.
3. Turn the ignition on.
4. Start the engine and allow it to idle.
5. Monitor the scan tool for at least two minutes.
6. With the scan tool, read DTCs.

NOTE: The P053A-Crankcase Vent Heater Control Circuit Open DTC should be active or pending with the jumper in place.

Did P053A-Crankcase Vent Heater Control Circuit Open DTC display as active with the jumper in place?

Yes

- Replace the Crankcase Vent Heater.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0544-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT-BANK 1 SENSOR 1

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor or thermistor resistance is high. When the exhaust gas temperature is hot, the sensor resistance is low. Exhaust Gas Temperature Sensor 1/1 is located at the outlet of the Exhaust Manifold. It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the Exhaust Manifold. This is a 1-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM will also disable active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the pre-Catalyst Exhaust Gas Temperature (EGT) Sensor 1/1 failed the plausibility check performed once every ignition cycle.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (K385) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE EXHAUST GAS TEMPERATURE (EGT) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0545-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1 SENSOR 1

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor or thermistor resistance is high. When the exhaust gas temperature is hot, the sensor resistance is low. Exhaust Gas Temperature Sensor 1/1 is located at the outlet of the Exhaust Manifold. It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the Exhaust Manifold. This is a 1-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM will also disable active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the EGT Sensor 1/1 Temperature Signal circuit is below a calibrated voltage for a pre-determined amount of time.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT SHORT TO GROUND
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT SHORT TO THE SENSOR GROUND CIRCUIT
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO THE (K385) SENSOR GROUND CIRCUIT

1. The ignition must be off when checking for a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: **There should be no continuity between the circuits being tested.**

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE EXHAUST GAS TEMPERATURE (EGT) 1/1 SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0546-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH - BANK 1 SENSOR 1

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor or thermistor resistance is high. When the exhaust gas temperature is hot, the sensor resistance is low. Exhaust Gas Temperature Sensor 1/1 is located at the outlet of the Exhaust Manifold. It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the Exhaust Manifold. This is a 1-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM will also disable active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGT Sensor 1/1 Temperature Signal circuit is above a calibrated voltage for a pre-determined amount of time.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
EGT SENSOR 1/1 TEMPERATURE SIGNAL CIRCUIT SHORT TO VOLTAGE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE (K385) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE EGT SENSOR 1/1 (K384) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE EXHAUST GAS TEMPERATURE 1/1 (EGT) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P054E-00-IDLE CONTROL SYSTEM - FUEL QUANTITY LOWER THAN EXPECTED

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The Powertrain Control Module (PCM) meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

The PCM monitors the idle fuel control system using two separate monitors. The first monitor will detect a failure if the idle control system cannot achieve or maintain the target idle speed (rpm's) within a calibrated tolerance. The second monitor will detect a failure if the idle control system cannot achieve the target idle speed with a fuel injection quantity within a calibrated tolerance. The injection quantity tolerance is a calibrated percentage of the normal injection quantity depending on engine speed, coolant temperature and selected transmission gear (i.e. park / neutral or drive / reverse).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The fuel quantity delivered by the injector is lower than a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there DTCs P0001, P0003, P0004, any Fuel Injector, APP Sensor, FRP Sensor, or VSS Sensor DTCs active or pending

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE INJECTORS AND FUEL INJECTOR SUPPLY USING THE INJECTOR KILL SYSTEM TEST

1. With the scan tool, perform the Injector Kill System test to identify the suspect injector.

Do any Injectors indicate a problem?

Yes

- Replace the damaged or obstructed Fuel Injector in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P054F-00-IDLE CONTROL SYSTEM - FUEL QUANTITY HIGHER THAN EXPECTED

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Fuel Quantity Solenoid (FQS) works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is positioned in the inlet side of the High Pressure Delivery Pump (HPDP). The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The Powertrain Control Module (PCM) meters the amount of fuel entering the pumping chambers inside the HPDP. The FPR is positioned at the return passage of the Fuel Rail. The solenoid receives both the 12 Volt supply and a duty-cycle ground signal from the PCM. The FPR is normally open when not being controlled by the PCM. The Fuel Rail return passage opens allowing fuel pressure in the rail to escape into the return circuit and on to the Fuel Tank. When the PCM is controlling the FPR signal, the solenoid valve closes allowing fuel pressure to build in the rail.

The PCM monitors the idle fuel control system using two separate monitors. The first monitor will detect a failure if the idle control system cannot achieve or maintain the target idle speed (rpm's) within a calibrated tolerance. The second monitor will detect a failure if the idle control system cannot achieve the target idle speed with a fuel injection quantity within a calibrated tolerance. The injection quantity tolerance is a calibrated percentage of the normal injection quantity depending on engine speed, coolant temperature and selected transmission gear (i.e. park / neutral or drive / reverse).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The fuel quantity delivered by the injector is lower than a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there DTCs P0001, P0003, P0004, any Fuel Injector, APP Sensor, FRP Sensor, or VSS Sensor DTCs active or pending

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE INJECTORS AND FUEL INJECTOR SUPPLY USING THE INJECTOR KILL SYSTEM TEST

1. With the scan tool, perform the Injector Kill System test to identify the suspect injector.

Do any Injectors indicate a problem?

Yes

- Replace the damaged or obstructed Fuel Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0556-00-BRAKE BOOSTER PRESSURE SENSOR CIRCUIT PERFORMANCE

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With ignition on. Battery voltage above 10.0 Volts.

SET CONDITION

- The ABS system detects a signal from the Vacuum Pressure Sensor that is not within a pre-determined threshold.

POSSIBLE CAUSES

Possible Causes
EVP SIGNAL CIRCUIT OPEN
EVP SIGNAL CIRCUIT SHORTED TO GROUND
EVP SIGNAL CIRCUIT SHORTED TO VOLTAGE
ELECTRIC VACUUM PUMP PRESSURE SENSOR
OTHER ABS DTCS PRESENT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR ABS DTCS

Are there any ABS DTCs related to the Brake Boost Sensor present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the ABS VERIFICATION TEST diagnostic procedure. Refer to [ABS VERIFICATION TEST](#) .

P0557-00-BRAKE BOOSTER PRESSURE SENSOR CIRCUIT LOW

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With ignition on. Battery voltage above 10.0 Volts.

SET CONDITION

- The ABS system detects a signal from the Vacuum Pressure Sensor that is not within a pre-determined threshold.

POSSIBLE CAUSES

Possible Causes
EVP SIGNAL CIRCUIT OPEN
EVP SIGNAL CIRCUIT SHORTED TO GROUND
EVP SIGNAL CIRCUIT SHORTED TO VOLTAGE
ELECTRIC VACUUM PUMP PRESSURE SENSOR
OTHER ABS DTCS PRESENT

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR ABS DTCS

Are there any ABS DTCs related to the Brake Boost Sensor present?

Yes

- Perform the appropriate diagnostic procedure. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the ABS VERIFICATION TEST diagnostic procedure. Refer to [ABS VERIFICATION TEST](#) .

P0558-00-BRAKE BOOSTER PRESSURE SENSOR CIRCUIT HIGH

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With ignition on. Battery voltage above 10.0 Volts.

SET CONDITION

- The ABS system detects a signal from the Vacuum Pressure Sensor that is not within a pre-determined threshold.

POSSIBLE CAUSES

Possible Causes
EVP SIGNAL CIRCUIT OPEN
EVP SIGNAL CIRCUIT SHORTED TO GROUND
EVP SIGNAL CIRCUIT SHORTED TO VOLTAGE
ELECTRIC VACUUM PUMP PRESSURE SENSOR
OTHER ABS DTCS PRESENT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR ABS DTCS

Are there any ABS DTCS related to the Brake Boost Sensor present?

Yes

- Perform the appropriate diagnostic procedure. Refer to **ANTILOCK BRAKE SYSTEM (ABS)-
DIAGNOSTIC CODE INDEX** .

No

- Perform the ABS VERIFICATION TEST diagnostic procedure. Refer to **ABS VERIFICATION
TEST** .

P0562-00-BATTERY/SYSTEM VOLTAGE LOW

THEORY OF OPERATION

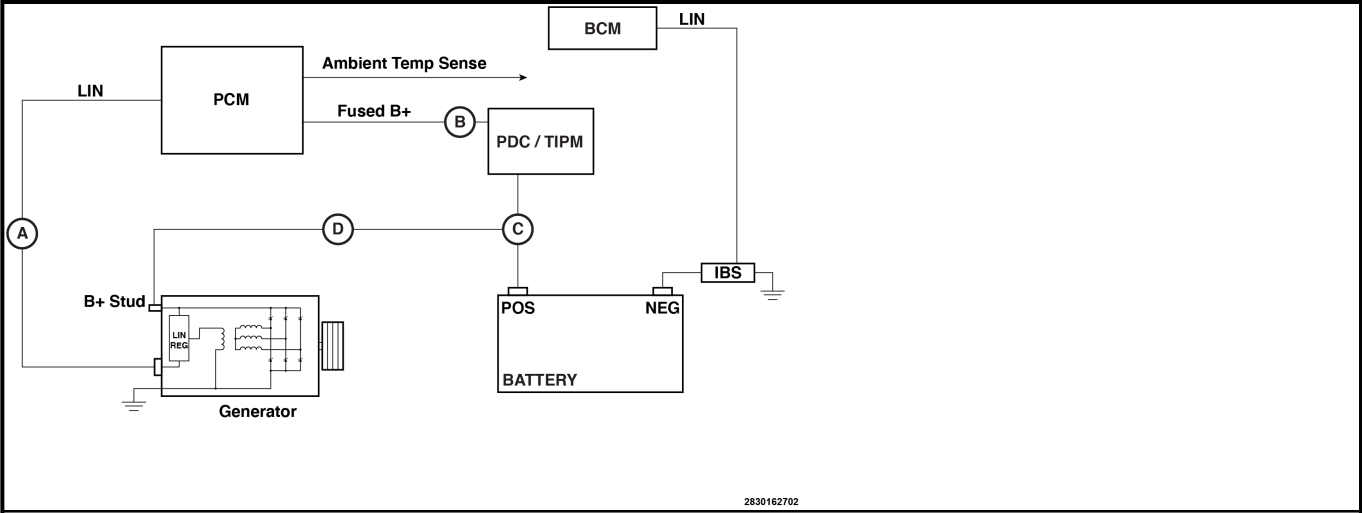
The Smart Alternator communicates with the Powertrain Control Module (PCM) over a Pulse Width Modulated (PWM) LIN BUS communication circuit. The Smart Alternator contains an Intelligent Voltage Regulator that controls the Alternator overall operation. The Smart Alternator requires Battery supply on the Fused B+ circuit

and a good case ground to power up the internal regulator and operate correctly. **The PCM sends the Smart Alternator the following messages/commands over the LIN BUS circuit.**

- Wake-up signal
- Voltage set point
- Ramp time
- Maximum current output based on operating and environmental conditions

The Smart Alternator controls the charging rate based on the PCM commands. The Smart Alternator also performs diagnostics for electrical and mechanical faults with the Alternator. **The Smart Alternator sends the following information/faults regarding diagnostics and Alternator load conditions to the PCM:**

- Regulator duty cycle
- Internal Battery voltage
- Measured energizing current
- Integrated circuit temperature
- Pulley rotational speed
- Errors messages for internal mechanical error, electrical error, or over temperature error



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the ignition is on, except during cranking.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the battery voltage is below the minimum threshold for 25 seconds.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM FAULTY
CHECKING PCM POWER AND GROUNDS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE CHARGING SYSTEM OPERATION

NOTE: **This DTC will most likely be caused by a charging system problem. Use the Service Information and verify proper charging system operation before continuing.**

1. Perform the CHARGING SYSTEM diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#) .

Were any problems found with the Charging System?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0563-00-BATTERY/SYSTEM VOLTAGE HIGH

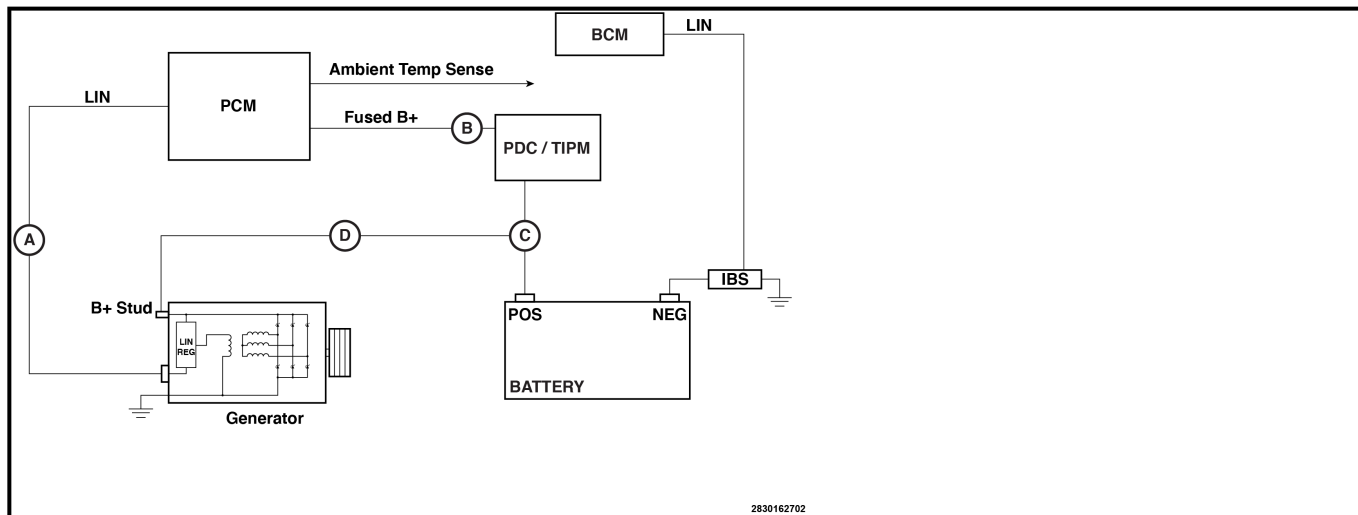
THEORY OF OPERATION

The Smart Alternator communicates with the Powertrain Control Module (PCM) over a Pulse Width Modulated (PWM) LIN BUS communication circuit. The Smart Alternator contains an Intelligent Voltage Regulator that controls the Alternator overall operation. The Smart Alternator requires Battery supply on the Fused B+ circuit and a good case ground to power up the internal regulator and operate correctly. **The PCM sends the Smart Alternator the following messages/commands over the LIN BUS circuit.**

- Wake-up signal
- Voltage set point
- Ramp time
- Maximum current output based on operating and environmental conditions

The Smart Alternator controls the charging rate based on the PCM commands. The Smart Alternator also performs diagnostics for electrical and mechanical faults with the Alternator. **The Smart Alternator sends the following information/faults regarding diagnostics and Alternator load conditions to the PCM:**

- Regulator duty cycle
- Internal Battery voltage
- Measured energizing current
- Integrated circuit temperature
- Pulley rotational speed
- Errors messages for internal mechanical error, electrical error, or over temperature error



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Any time the ignition is on, except during cranking.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the battery voltage is above the maximum threshold for 25 seconds.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM FAULTY
CHECKING PCM POWER AND GROUNDS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE CHARGING SYSTEM OPERATION

NOTE: This DTC will most likely be caused by a charging system problem. Use the Service Information and verify proper charging system operation before continuing.

1. Perform the CHARGING SYSTEM diagnostic procedure. Refer to [DIAGNOSIS AND TESTING](#).

Were any problems found with the Charging System?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P057B-00-BRAKE PEDAL POSITION SENSOR "A" CIRCUIT PERFORMANCE

For a complete BRAKE SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- No circuit faults present for Brake Pedal Position Sensor, Master Cylinder Pressure Sensor, or Brake Torque signal.

SET CONDITION

- The Powertrain Control Module (PCM) receives over the CAN Bus a message from the Anti-lock Brake System (ABS) Module indicating that a correlation error exists between the Brake Pedal Position (BPP) Sensor and either the Master Cylinder Pressure Sensor or the Brake Torque signal.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
BPP SENSOR CALIBRATION BRAKE PEDAL POSITION (BPP) SENSOR ANTI-LOCK BRAKE (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any ABS DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. PERFORM BRAKE PEDAL CALIBRATION PROCEDURE IN THE ABS AND PCM MODULES

1. Park the vehicle on level ground.

2. With the scan tool, navigate to "Miscellaneous Functions" in the ABS Module and perform the "Brake Pedal Calibration" routine.
3. After completion, navigate to "Miscellaneous Functions" in the PCM and perform the "Brake Pedal Learn" routine. When performing the Brake Pedal Learn routine make sure the Brake Pedal is not pressed.

NOTE: Not all PCM's support the Brake Pedal Learn routine. The routine will not show up in the scan tool if it is not available.

4. With the scan tool. erase DTCs.
5. Start the engine and test drive the vehicle operating the brakes several times.
6. With the scan tool. read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Calibrating the BPP Sensor has repaired the fault.
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

5. REPLACE THE BPP SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information. Refer to [SENSOR, STOP LAMP, REMOVAL AND INSTALLATION](#) .
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED ABS AND COMPONENT CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS Module harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS Module harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS Module DTCs.

Did the DTC return?

Yes

- Replace the Anti-lock Brake System (ABS) Module in accordance with the Service Information. Refer to MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION.
- Perform ABS VERIFICATION TEST. Refer to ABS VERIFICATION TEST.

No

- The wiring or poor connection problem has been repaired.
- Perform ABS VERIFICATION TEST. Refer to ABS VERIFICATION TEST.

P057C-00-BRAKE PEDAL POSITION SENSOR CIRCUIT LOW

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) receives over the CAN Bus a message from the Anti-lock Brake System (ABS) Module indicating that the Brake Pedal Position (BPP) Sensor signal voltage is below the calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
BPP SENSOR POSITION SIGNAL CIRCUIT SHORTED TO GROUND
BPP SENSOR POSITION SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
BPP SENSOR POSITION SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
BRAKE PEDAL POSITION (BPP) SENSOR
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR A SHORT TO THE (B937) SENSOR RETURN CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE ABILITY OF THE PCM TO READ THE BRAKE PEDAL SENSOR SIGNAL

1. Reconnect the ABS Module harness connector.
2. Connect a jumper between the BPP Sensor (B137) Position Signal circuit and the (B237) 5-Volt Supply circuit at the BPP Sensor harness connector.
3. Turn the ignition on.
4. With the scan tool, read DTCs in the ABS Module.

NOTE: The P057D-BRAKE PEDAL POSITION SENSOR CIRCUIT HIGH DTC should be active or pending with the jumper in place.

Does the scan tool display as described above?

Yes

- Verify that there is good pin to terminal contact at the BPP Sensor connector and ABS Module connector. Replace the BPP Sensor if no problems were found in the connector.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE ANTI-LOCK BRAKE MODULE FOR BRAKE PEDAL SENSOR FAULTS

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against the Brake Pedal Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .

No

- Replace the ABS Module in accordance with the Service Information. Refer to [MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P057D-00-BRAKE PEDAL POSITION SENSOR CIRCUIT HIGH

For a complete BRAKE SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 10.4 volts.

SET CONDITION

- The PCM detects that the BPP Sensor signal voltage is above the calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
BRAKE PEDAL SENSOR WIRING SHORTED TO VOLTAGE
BPP POSITION SIGNAL CIRCUIT SHORTED TO THE BPP 5-VOLT SUPPLY CIRCUIT
BPP SENSOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
BPP SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
BRAKE PEDAL SENSOR
ANTI LOCK BRAKE CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any system voltage or 5-Volt Reference DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the harness connector at the component of the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Turn the ignition on.
4. Using a DVOM, measure the voltage of the circuit being tested at the component harness connector.

NOTE: The voltage on a 5.0 volt signal or reference circuit should be between approximately 4.8 and 5.2 volts.

Is the voltage above 5.2 volts?

Yes

- Go To [2](#)

No

- Go To [5](#)

4. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

5. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR A SHORT TO THE (B237) 5-VOLT SUPPLY CIRCUIT

1. The ignition must be off when checking for a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the test leads of the DVOM and check for continuity between the circuits being tested at the component harness connector.

NOTE: There should be no continuity between the circuits being tested.

Is there continuity between the circuits?

Yes

- Repair the short between the circuits.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. ISOLATE AND CHECK THE BPP SENSOR (B137) POSITION SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. ISOLATE AND CHECK THE BPP SENSOR (B937) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK THE ABILITY OF THE PCM TO READ THE BPP SENSOR SIGNAL

1. Turn the ignition off.
2. Reconnect the ABS harness connector.
3. Connect a jumper between the BPP Sensor (B137) Position Signal circuit and the BPP Sensor (B937) Return circuit at the Brake Pedal Sensor harness connector.
4. Turn the ignition on.
5. With the scan tool, read DTCs.

NOTE: The scan tool should display the **P057C-BRAKE PEDAL SENSOR SIGNAL CIRCUIT LOW DTC** as active or pending with the jumper in place.

Does the scan tool display the voltage as described above?

Yes

- Verify that there is good pin to terminal contact in the BPP Sensor and ABS Control Module connectors. Replace the BPP Sensor if no problems were found with the connectors.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Remove the jumper.
- Go To [9](#)

9. CHECK THE ANTI-LOCK BRAKE MODULE FOR BRAKE PEDAL SENSOR FAULTS

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against a Brake Pedal Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to [**ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX**](#) .

No

- Replace the ABS Module in accordance with the Service Information. Refer to [**MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0578-00-SPEED CONTROL SWITCH 1 STUCK

For a complete SPEED CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Steering Column Control Module (SCCM) has detected that Speed Control Switch is stuck.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
SPEED CONTROL SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Perform Diagnostics in the Steering Column Control Module (SCCM).

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P0585-00-SPEED CONTROL SWITCH 1 / 2 CORRELATION

For a complete SPEED CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Steering Column Control Module (SCCM) has detected that a non-permissible combination has occurred in the Speed Control Switch.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
SPEED CONTROL SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE SPEED CONTROL SWITCH OPERATION

WARNING: Turn the ignition off disconnect the 12-volt battery and wait two minutes before proceeding. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Do not place an intact non-deployed airbag face down on a hard surface, the airbag propels into the air if accidentally deployed. Failure to follow these instructions may result in possible serious or fatal injury.

NOTE: Visually and physically inspect the wiring harness between the Speed Control Switch harness connector and the SCCM harness connector. Repair any damaged wires, connectors, and open/spread terminals. If harness is OK, proceed with test.

1. Turn the ignition off.
2. Install the Speed Control Switch in accordance with the Service Information.
3. Turn the ignition on.
4. Move the Speed Control Switch to each position several times.
5. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Speed Control Switch in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P058B-00-BATTERY MONITOR MODULE CURRENT MONITORING PERFORMANCE

For a complete STARTING SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION - SMART CHARGING STRATEGY

Vehicles that utilize the Smart Charging control strategy are equipped with an Intelligent Battery Sensor (IBS). The Smart Charging strategy can be used with any combination of the following configurations:

- Single Battery system.
- Dual Battery system.
- Electronic Voltage Regulation (EVR) Charging systems using a standard Alternator directly controlled by the PCM.
- Charging systems using a Smart Alternator communicating with the PCM via LIN Bus.

The IBS is an important component of the Smart Charging control strategy. The Smart Charging control functions differently than the traditional EVR systems that do not utilize an IBS. When the IBS is reporting little to no electrical demand on the Battery, particularly at idle, it is common for the PCM to suspend charging, reducing the load on the engine. This in turn helps with emissions and fuel economy. Because of this strategy it is not uncommon for the voltage at the Alternator stud to be equal to, or close to Battery voltage at idle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Battery voltage above 11.0 volts.
- The Battery current is continuously monitored during the different transitions from engine running, to an Auto Stop, during Auto Stop, to an Auto Start, and back to engine running. The readings from the Intelligent Battery Sensor (IBS) are compared to rational readings for each transition.

SET CONDITION

- The IBS is reporting an irrational current value during any of the transition periods.

DEFAULT ACTION

- This is a non-MIL fault.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
INTELLIGENT BATTERY SENSOR (IBS)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, create a Vehicle Scan Report and attach it to the repair order.
3. With the scan tool, read the Engine Control Module (ECM) DTCs.

NOTE: **Diagnose any battery or charging system faults before continuing.**

Is the DTC active?

Yes

- Replace the Intelligent Battery Sensor in accordance with the service information. Refer to SENSOR, INTELLIGENT BATTERY (IBS), REMOVAL AND INSTALLATION .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to PCM VERIFICATION TEST .

No

- Review the Vehicle Scan Report and Repair any other DTCs that have set with the appropriate procedure in Service Information.

P058D-00-BATTERY MONITOR MODULE VOLTAGE MONITORING PERFORMANCE

For a complete STARTING SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION - SMART CHARGING STRATEGY

Vehicles that utilize the Smart Charging control strategy are equipped with an Intelligent Battery Sensor (IBS). The Smart Charging strategy can be used with any combination of the following configurations:

- Single Battery system.
- Dual Battery system.
- Electronic Voltage Regulation (EVR) Charging systems using a standard Alternator directly controlled by the PCM.
- Charging systems using a Smart Alternator communicating with the PCM via LIN Bus.

The IBS is an important component of the Smart Charging control strategy. The Smart Charging control functions differently than the traditional EVR systems that do not utilize an IBS. When the IBS is reporting little to no electrical demand on the Battery, particularly at idle, it is common for the PCM to suspend charging, reducing the load on the engine. This in turn helps with emissions and fuel economy. Because of this strategy it is not uncommon for the voltage at the Alternator stud to be equal to, or close to Battery voltage at idle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the Battery voltage above 11.0 volts.
- The Battery voltage is continuously monitored during the different transitions from engine running, to an Auto Stop, during Auto Stop, to an Auto Start, and back to engine running.
- The readings from the Intelligent Battery Sensor (IBS) are compared to rational readings for each transition.

SET CONDITION

- The IBS is reporting an irrational voltage value during any of the transition periods.

DEFAULT ACTION

- The MIL will illuminate.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
INTELLIGENT BATTERY SENSOR (IBS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE IBS (A916) FUSED B+ CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

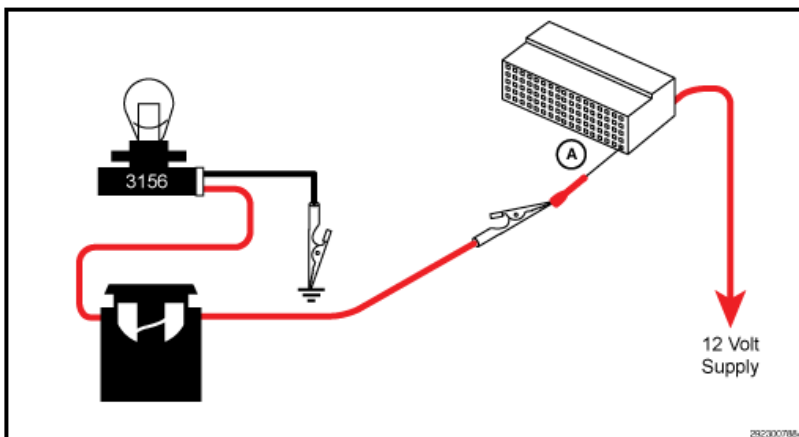
NOTE: Note: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .

NOTE: Note: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Note: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [**CIRCUIT LOAD TESTING PROCEDURES**](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse in the PDC is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE IBS (Z901) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the ground circuit.
2. Connect the positive lead of the load test tool to the positive side of the Battery.
3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

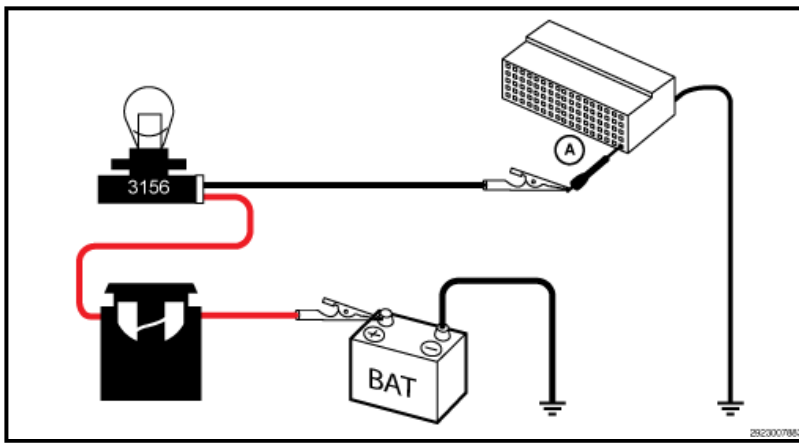
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE INTELLIGENT BATTERY SENSOR (IBS)

The Intelligent Battery Sensor is reporting an irrational voltage signal, view repair to continue.

Repair

- Replace the Intelligent Battery Sensor in accordance with the service information. Refer to [SENSOR, INTELLIGENT BATTERY \(IBS\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P059F-00-ACTIVE GRILLE AIR SHUTTER 1 PERFORMANCE

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Ambient Air Temperature or Engine Coolant Temperature above -7°C (19.4°F).

SET CONDITION

- The Powertrain Control Module (PCM) receives a message from the Active Grill Shutter Actuator that the open to close position travel is above 120 degrees or the mechanical stop was detected before the commanded position was reached.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ACTIVE GRILL SHUTTER ACTUATOR POOR ELECTRICAL CONNECTION
ACTIVE GRILL SHUTTER OBSTRUCTED/BINDING
ACTIVE GRILL SHUTTER ACTUATOR LINKAGE DISCONNECTED/BINDING/BROKEN
ACTIVE GRILL SHUTTER ACTUATOR MOUNTING HARDWARE LOOSE OR MISSING
ACTIVE GRILL SHUTTER ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ACTIVE GRILL SHUTTER OPERATION

1. Turn the ignition off.
2. Visually inspect the Active Grill Shutter Assembly for the items listed but not limited to the following:
 - Dirt, ice or obstructions that could cause the Active Grill Shutter Assembly to bind causing linkage or shutters to become disconnected
 - Damaged or disconnected Active Grill Shutter Actuator linkages
 - Damaged Active Grill Shutter Assembly frame or shutters
 - Loose or missing Active Grill Shutter Actuator mounting bolts/retainers

Were any problems found?

Yes

- Repair as necessary. With the scan tool perform the Active Grill Shutter test to validate repair(s).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the Active Grill Shutter Actuator in accordance with the Service Information. With the scan tool, perform the Active Grille Shutter Replaced procedure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P05A7-00-ACTIVE GRILLE AIR SHUTTER 1 SUPPLY VOLTAGE CIRCUIT LOW

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

- This diagnostic runs continuously with the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Active Grill Shutter (AGS) B+ circuit voltage is below 8.0 volts for 15.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- The AGS suspends all shutter movement when AGS B+ supply voltage is below 8.0 volts. AGS operation resumes when the voltage is restored to above 8.0 volts.
- The PCM Suspends communication with AGS for remainder of key cycle.

POSSIBLE CAUSES

Possible Causes
ACTIVE GRILL SHUTTER FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
ACTIVE GRILL SHUTTER GROUND CIRCUIT OPEN/HIGH RESISTANCE
ACTIVE GRILL SHUTTER ACTUATOR
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE (A940) FUSED B+ CIRCUIT FOR AN OPEN/HIGH RESISTANCE

NOTE: Verify the integrity of the (A940) Fused B+ supply Fuse.

1. Turn the ignition off.

NOTE: Before continuing to the next step, confirm that the AGS harness connector was properly installed before disconnecting it.

2. Disconnect the AGS harness connector.
3. Disconnect the Power Distribution Center (PDC) C2 harness connector.
4. Measure the resistance of the (A940) Fused B+ circuit between the AGS harness connector and the PDC C2 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the AGS Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (Z921) AGS GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance between ground and the (Z921) AGS Ground circuit at the AGS harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (Z921) AGS Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. INSPECT THE ACTIVE GRILL SHUTTER ACTUATOR WIRING AND CONNECTORS

1. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the Active Grill Shutter Actuator and the Powertrain Control Module (PCM).

NOTE: When inspecting wiring and connectors be sure to include inspection of midline connectors in the circuit.

2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for any loose, or partially broken ground wires.
4. Check for broken, bent, pushed out or corroded terminals. Verify that there is good pin to terminal contact in the Active Grill Shutter Actuator and Powertrain Control Module connectors.

Were there any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE ACTIVE GRILL SHUTTER ACTUATOR OPERATION

1. Replace the AGS in accordance with the Service Information.
2. Reconnect the PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool erase DTCs. Navigate to Miscellaneous functions and perform the 'Active Grille Shutter Replaced' procedure.
5. Start the engine.
6. With the scan tool read DTCs

Did the DTC return?

Yes

- Go To [6](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P05A8-00-ACTIVE GRILLE AIR SHUTTER 1 SUPPLY VOLTAGE CIRCUIT HIGH

For a complete COOLING SYSTEM wiring diagram, **refer to the appropriate wiring information**.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the voltage on the LIN BUS circuit is above 17.5 volts for 6.4 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO VOLTAGE
HIGH RESISTANCE IN THE ACTIVE GRILL SHUTTER ACTUATOR POWER OR GROUND CIRCUITS
ALTERNATOR FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE (OVERCHARGING)
ALTERNATOR
ACTIVE GRILL SHUTTER ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE (A940) FUSED B(+) CIRCUITS AT THE ACTIVE GRILL SHUTTER ACTUATOR

1. Disconnect the Active Grill Shutter Actuator harness connector.
2. Turn the ignition on.
3. Measure the voltage on both (A940) Fused B(+) circuits at the Active Grill Shutter Actuator harness connector.

Is the voltage equal to battery voltage?

Yes

- Go To [3](#)

No

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE (Z921) GROUND CIRCUIT AT THE ACTIVE GRILL SHUTTER ACTUATOR

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z921) Ground circuit at the Active Grill Shutter Actuator harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (Z921) Ground circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between the (D511) LIN BUS circuit and all other circuits at the PCM C1 harness connector.

Is the resistance above 10k Ohms between the (D511) LIN BUS circuit and all other circuits?

Yes

- Go To [5](#)

No

- Repair (D511) LIN BUS circuit for a short to the circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE ABILITY OF THE PCM TO MONITOR THE ACTIVE GRILL SHUTTER ACTUATOR OPERATION

1. Replace the AGS in accordance with the Service Information.
2. Reconnect the PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool erase DTCs. Navigate to Miscellaneous functions and perform the 'Active Grille Shutter Replaced' procedure.
5. Start the engine.
6. With the scan tool read DTCs

Did the DTC return?

Yes

- Go To [6](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P05C0-00-ACTIVE GRILLE AIR SHUTTER MODULE 1 OVER TEMPERATURE

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

- This diagnostic runs continuously with the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) receives a message from the Active Grill Shutter Actuator that the internal actuator temperature is above 165Â°C (329Â°F) for 6.4 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ACTIVE GRILL SHUTTER OBSTRUCTED/BINDING
ACTIVE GRILL SHUTTER ACTUATOR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE ACTIVE GRILL SHUTTER FOR AN OBSTRUCTION

1. Turn the ignition off.
2. Visually inspect for signs of any possible obstructions of the Active Grill Shutter.

Were any problems found?

Yes

- Repair the obstruction and retest for an active fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Active Grill Shutter Actuator. Navigate to Miscellaneous functions and perform the 'Active Grille Shutter Replaced' procedure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P05EC-00-COLD START INJECTION TIMING PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a fueling quantity error on two consecutive trips. The MIL will come on when the diagnostic fails on two consecutive trips.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HIGH PRESSURE FUEL DELIVERY
LOW PRESSURE FUEL DELIVERY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other Fuel Pressure DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

P05ED-00-REDUCTANT HEATER CONTROL MODULE SUPPLY VOLTAGE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- A calibrated amount of time after Diesel Exhaust Fluid Tank heating is first commanded.

SET CONDITION

- The DEF Tank heater has been on long enough for sufficient thawing of the Diesel Exhaust Fluid and the DEF system is still not able to prime. The HCU reports to the PCM that there is a lack of supply Voltage.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED B+ SUPPLY VOLTAGE CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY VOLTAGE CIRCUIT OPEN/HIGH RESISTANCE
DEF HEATER CONTROL UNIT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ASD (F343) SUPPLY VOLTAGE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the DEF HCU harness connector.
3. Turn the ignition on.
4. Using a 12-Volt test light connected to ground, check the ASD (F343) Supply Voltage circuit.

Is the test light illumination equal to a direct connection to (B+) Battery?

Yes

- Go To [3](#)

No

- Repair the ASD (F343) Supply Voltage circuit for an open/high resistance. Make sure to check all fuses in the Main PDC and Aux PDC for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE DEF HCU (A914) SUPPLY VOLTAGE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition on.
2. Using a 12-Volt test light connected to ground, check the DEF HCU (A914) Supply Voltage circuit.

Is the test light illumination equal to a direct connection to (B+) Battery?

Yes

- Go To [4](#)

No

- Repair the DEF HCU (A914) Supply Voltage circuit for an open/high resistance. Make sure to check all fuses in the Main PDC and Aux PDC for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read the DTCs.

Did the DTC return?

Yes

- Replace the DEF Heater Control Unit in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P05EE-00-REDUCTANT PUMP SUPPLY VOLTAGE CIRCUIT OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

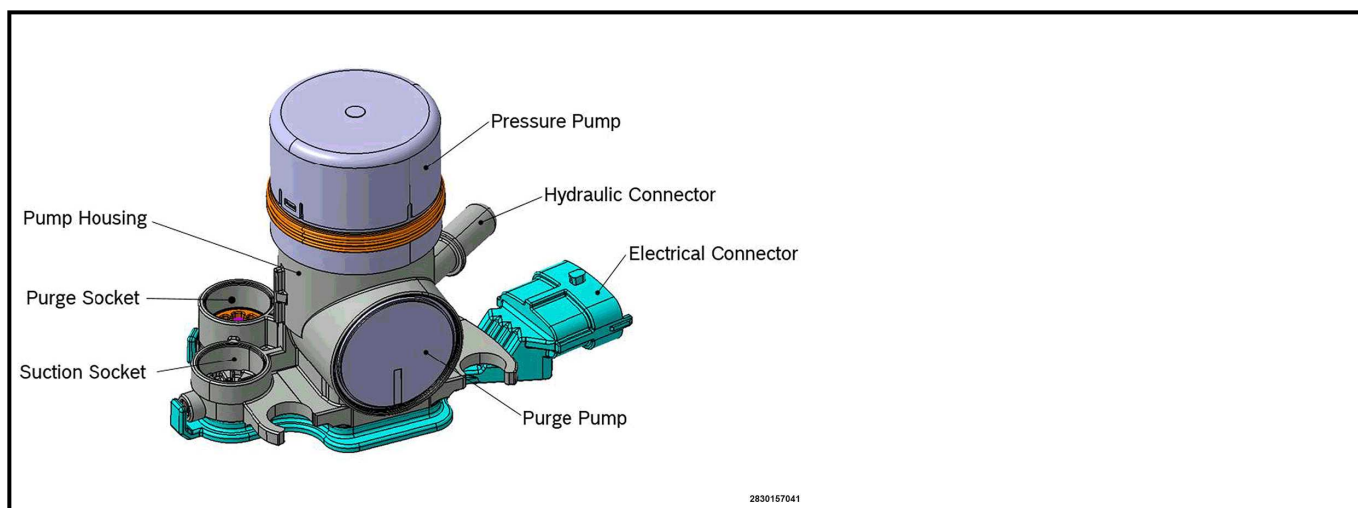
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134°C (273°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11°C (12°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The PCM detects that the DEF Supply Pump Supply circuit is open for more than one second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSE F19 OPEN
DEF PUMP
POWER DISTRIBUTION CENTER (PDC)
DEF SUPPLY PUMP SUPPLY VOLTAGE CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, using the scan tool, run and save a Vehicle Scan Report, FreezeFrame Data, and any other recorded information available.
3. With the scan tool, erase all DTCs.
4. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
7. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE F19 FUSE FOR AN OPEN

1. Inspect Fuse F19-20A in the PDC.

Is the Fuse open?

Yes

- Replace Fuse F19-20A. Then, determine the cause of the short circuit. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DIESEL EXHAUST FLUID SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the appropriate PDC harness connector.
3. Disconnect the appropriate DEF Pump harness connector.
4. Measure the continuity of the DEF Supply Pump (F203) Supply circuit between the PDC harness connector and the DEF Pump harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Supply Pump (F203) Supply circuit for an open or high resistance. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE SCR RELAY 1 FOR PROPER OPERATION

1. Reconnect the PDC harness connector.
2. Leave the DEF Pump harness connector disconnected.
3. Turn the ignition on.

NOTE: The SCR Relay 1 is a Printed Circuit Board (PCB) relay and is operated using a low-side driver (LSD). Back probing the relay control circuit with a test light connected to ground will activate the relay coil, which closes the relay.

4. Using a 12-volt test light connected to ground, back probe the (K401) SCR Relay 1 Control circuit at the PDC connector.

NOTE: The relay should make an audible click when closing. Another way to verify that the relay closed is to also back probe the (F203) DEF Supply Pump Supply Voltage circuit at the PDC harness connector. This is the relay output circuit. Continue to probe the (K401) SCR Relay 1 Control circuit with a 12-volt test light while checking the relay output circuit for voltage.

Did the relay close when connecting the (K401) SCR Relay 1 Control circuit to ground through the test light?

Yes

- Go To [5](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. REPLACE THE DEF PUMP AND RETEST FOR DTCS

1. Replace the DEF Pump in accordance with the Service Information.
2. Connect the DEF Pump and Electronic Control Unit (ECU) harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded [Freeze Frame / Environmental Data] and the When Monitored conditions, operate the vehicle under the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [6](#)

No

- Replacing the DEF Pump repaired the condition. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P05EF-00-REDUCTANT PUMP SUPPLY VOLTAGE CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

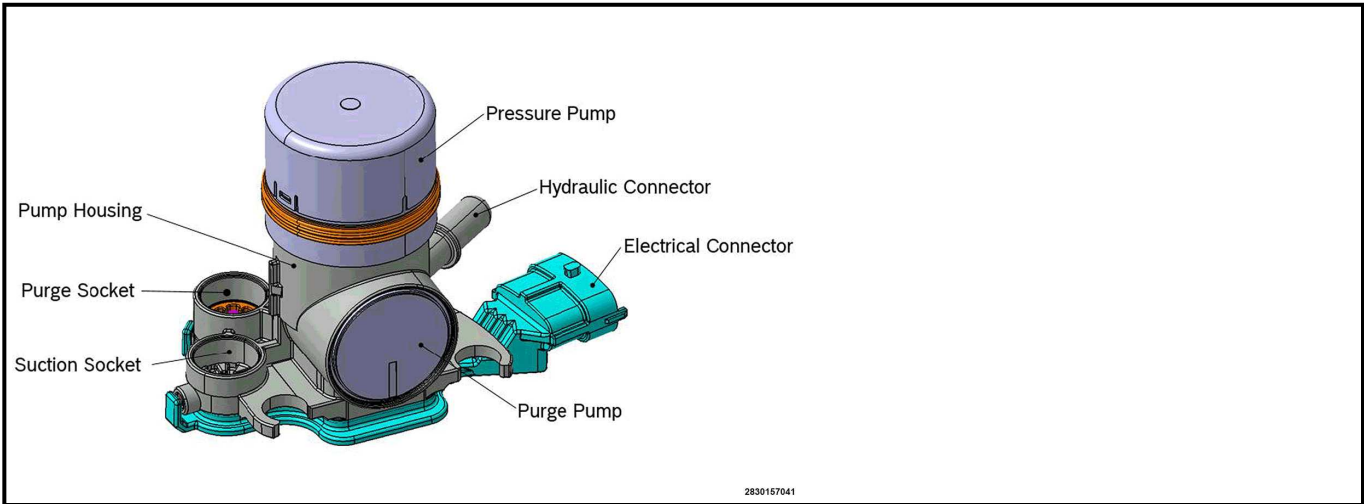
The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure

is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134Â°C (273Â°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11Â°C (12Â°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The DEF Supply Pump Supply Voltage circuit is determined to have voltage below a calibrated threshold for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SCR RELAY 1
DEF PUMP
AUXILIARY POWER DISTRIBUTION CENTER
DEF SUPPLY PUMP SUPPLY VOLTAGE CIRCUIT SHORT TO GROUND
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE SCR RELAY 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Install a new relay in place of the SCR Relay 1 in the Auxiliary PDC.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Replace the SCR Relay 1 in accordance with the Service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE DIESEL EXHAUST FLUID (DEF) SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR SHORT TO GROUND

1. Turn the ignition off.
2. Remove the SCR Relay 1 from the Auxiliary PDC.
3. Disconnect the DEF Pump C1 harness connector.
4. Measure the resistance between ground and the DEF Supply Pump (F203) Supply circuit at the DEF Pump Temp/Level Sensor C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE DEF SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the Auxiliary PDC C2 harness connector.
2. Measure the resistance between ground and the DEF Supply Pump (F203) Supply circuit at the DEF Pump C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Replace the Auxiliary Power Distribution Center in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Diesel Exhaust Fluid Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P05F0-00-REDUCTANT PUMP SUPPLY VOLTAGE CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

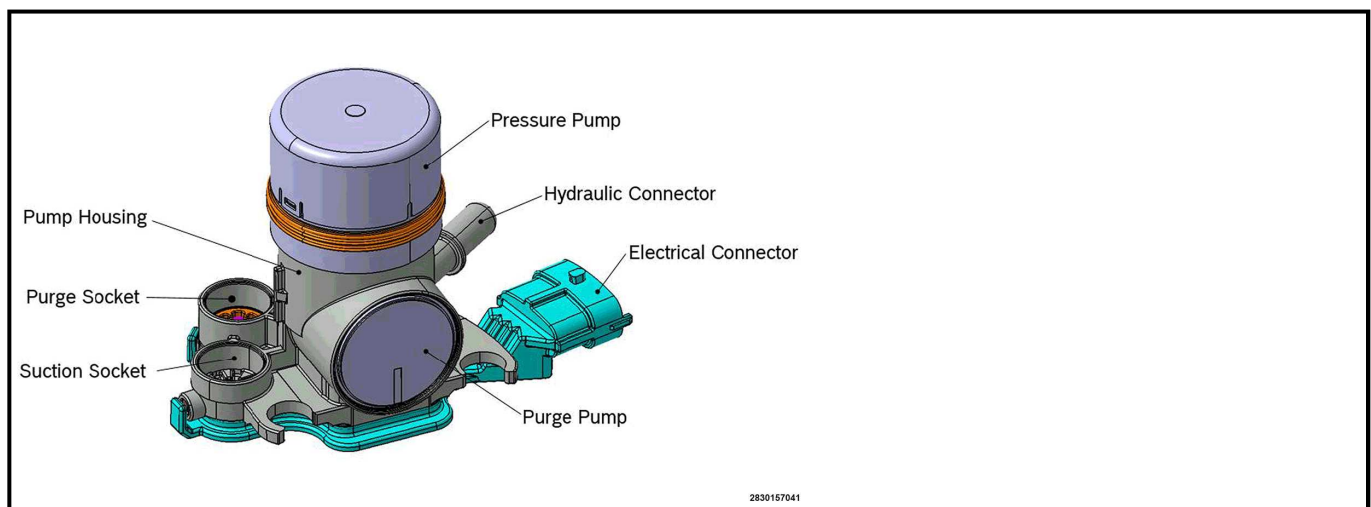
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134Â°C (273Â°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11Â°C (12Â°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The DEF Supply Pump Supply Voltage circuit is determined to have voltage above a calibrated threshold for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SCR RELAY 1
DEF PUMP
AUXILIARY POWER DISTRIBUTION CENTER
DEF SUPPLY PUMP SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE SCR RELAY 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Use a known good relay in place of the SCR Relay 1 in the Auxiliary PDC.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, select View DTCs.

Does the DTC return?

Yes

- Go To [3](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE DIESEL EXHAUST FLUID SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR SHORT TO VOLTAGE

1. Turn the ignition off.
2. Remove the SCR Relay 1 from the Auxiliary PDC.
3. Disconnect the DEF Pump C1 harness connector.
4. Turn the ignition on.
5. Measure the voltage on the DEF Supply Pump (F203) Supply circuit at the DEF Pump C1 harness connector.

Is there voltage present?

Yes

- Go To [4](#)

No

- Replace the Diesel Exhaust Fluid Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE DEF SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Auxiliary PDC C2 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Supply Pump (F203) Supply circuit at the DEF Pump C1 harness connector.

Is there voltage present?

Yes

- Repair the Diesel Exhaust Fluid Supply Pump (F203) Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Auxiliary Power Distribution Center in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

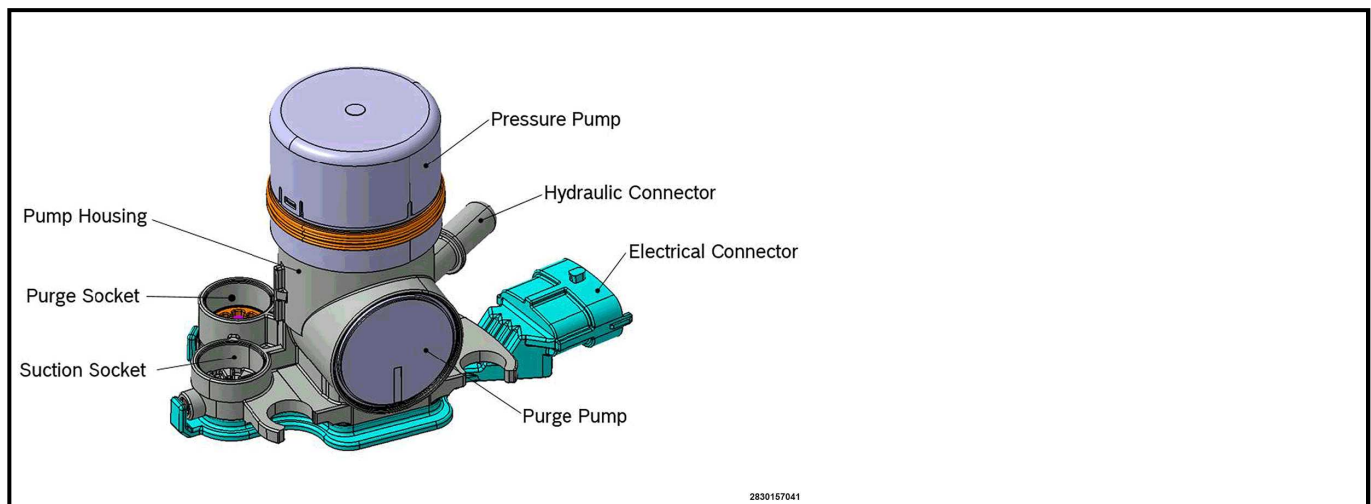
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134°C (273°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11°C (12°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- The PCM is commanding the SCR Relay 1 open.

SET CONDITION

- The DEF Voltage Supply circuit is determined to still have voltage present for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF SUPPLY PUMP SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE
SCR RELAY 1 CONTROL CIRCUIT SHORT TO GROUND
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P05EE, P05EF, or P05F0 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **[3.0L DIESEL - DIAGNOSTIC CODE INDEX](#)** .

No

- Go To [3](#)

3. CHECK THE DIESEL EXHAUST FLUID (DEF) SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR SHORT TO VOLTAGE

1. Turn the ignition off.
2. Remove Fuse F19-20A from the Power Distribution Center (PDC).
3. Disconnect the DEF Pump C1 harness connector.
4. Turn the ignition on.
5. Measure the voltage on the DEF Supply Pump (F203) Supply circuit at the DEF Pump C1 harness connector.

Is there voltage present?

Yes

- Go To [4](#)

No

- Replace the Diesel Exhaust Fluid Pump in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE SCR RELAY 1 (K401) CONTROL CIRCUIT FOR SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Disconnect the PDC C5 harness connector.
4. Measure for continuity between ground and the SCR Relay 1 (K401) Control circuit at the PCM C1 harness connector.

Is there continuity between ground and the SCR Relay 1 (K401) Control circuit?

Yes

- Repair the SCR Relay 1 (K401) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Measure for voltage at the pin that the DEF Pump (F203) Supply comes out of at the PDC C5 harness connector (PDC side).

Is there voltage present?

Yes

- Replace the Power Distribution Center in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the DEF Supply Pump (F203) Supply circuit for a short to voltage. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P05F2-00-REDUCTANT PUMP SUPPLY VOLTAGE CIRCUIT STUCK OFF

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

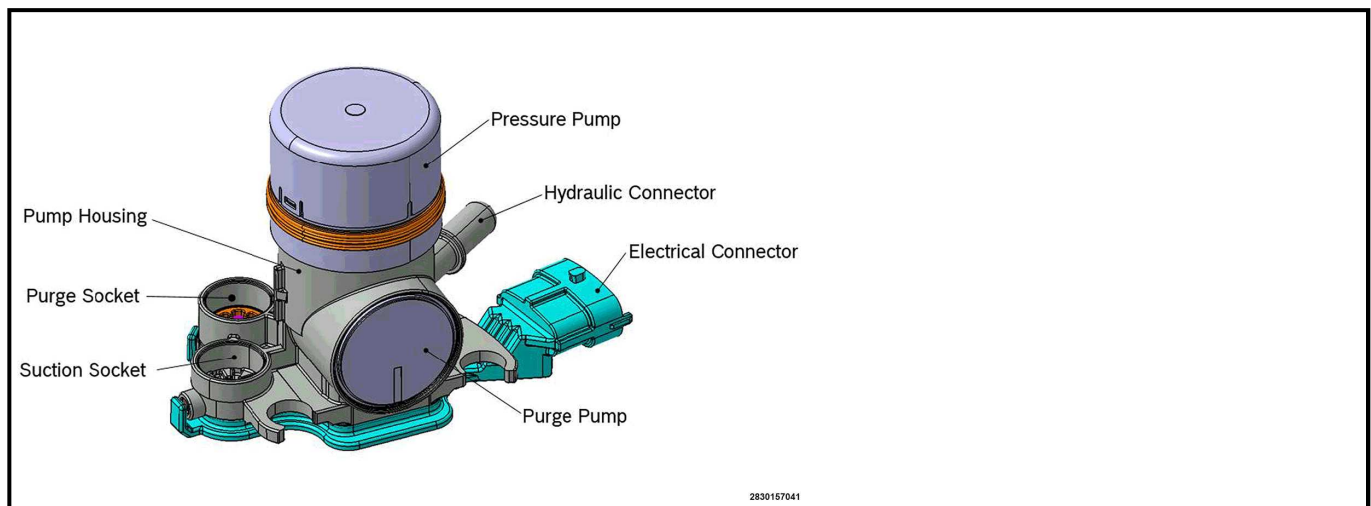
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134°C (273°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11°C (12°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- The PCM is commanding the SCR Relay 1 closed.

SET CONDITION

- The SCR Relay 1 Control circuit is determined to be stuck off for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWER DISTRIBUTION CENTER
SCR RELAY 1 CONTROL CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P05EE, P05EF, or P05F0 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE F87 FUSE FOR AN OPEN CONDITION

1. Turn the ignition off.
2. Check Fuse F87 (10a) in the Power Distribution Center for an open.

Was there an open in the Fuse?

Yes

- Diagnose the source of the short circuit that would cause the open condition and replace the F87 fuse.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE SCR RELAY 1 (K401) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Disconnect the PDC C2 harness connector.
4. Measure the resistance of the SCR Relay 1 (K401) Control circuit between the PDC C2 harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the SCR Relay 1 (K401) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE DEF SUPPLY PUMP (F203) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the DEF Pump C1 harness connector.
2. Measure the continuity of the DEF Supply Pump (F203) Supply circuit between the PDC C2 harness connector and the DEF Pump C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Replace the Power Distribution Center in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair DEF Supply Pump Supply (F203) circuit for an open/high resistance. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P05F3-00-EXHAUST AFTERTREATMENT POWER RELAY CONTROL CIRCUIT OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The SCR Relay 2 Control circuit is determined to be above 3.0 Volts for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SCR RELAY 2
POWER DISTRIBUTION CENTER (PDC)
SCR RELAY 2 CONTROL CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Use a known good relay in place of the SCR Relay 2 in the Power Distribution Center (PDC).
3. Ignition on, engine not running.
4. With the scan tool, erase DTCS in the Powertrain Control Module (PCM).
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, select View DTCS.

Does the DTC return?

Yes

- Go To [3](#)

No

- Repair is complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Remove the SCR Relay 2.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the SCR Relay 2 (K402) Control circuit between the SCR Relay 2 (in the PDC) and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PDC C3 harness connector.
2. Measure the resistance of the SCR Relay 2 (K402) Control circuit between the SCR Relay 2 (in the PDC) and the PDC C3 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the SCR Relay 2 (K402) Control circuit (between the PDC and the PCM) for an open/high resistance. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P05F4-00-EXHAUST AFTERTREATMENT POWER RELAY CONTROL CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The SCR Relay 2 Control circuit is determined to be below 2.0 Volts for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SCR RELAY 2
POWER DISTRIBUTION CENTER (PDC)
SCR RELAY 2 CONTROL CIRCUIT SHORT TO GROUND
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Use a known good relay in place of the SCR Relay 2 in the Power Distribution Center (PDC).
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, select View DTCs.

Does the DTC return?

Yes

- Go To [3](#)

No

- Repair is complete.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the SCR Relay 2.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the SCR Relay 2 (K402) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the PDC C3 harness connector.
2. Measure the resistance between ground and the SCR Relay 2 (K402) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Replace the Power Distribution Center in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the SCR Relay 2 (K402) Control circuit (between the PDC and the PCM) for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P05F5-00-EXHAUST AFTERTREATMENT POWER RELAY CONTROL CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The SCR Relay 2 Control circuit is determined to have a voltage present that is above a calibrated threshold for 1 second. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
SCR RELAY 2
POWER DISTRIBUTION CENTER (PDC)
SCR RELAY 2 CONTROL CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE SCR RELAY 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Use a known good relay in place of the SCR Relay 2 in the Power Distribution Center (PDC).
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
5. Start the engine and allow it to reach normal operating temperature.
6. With the scan tool, select View DTCs.

Does the DTC return?

Yes

- Go To [3](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Remove the SCR Relay 2.
3. Disconnect the PCM C1 harness connector.
4. Measure the voltage on the SCR Relay 2 (K402) Control circuit at the PCM C1 harness connector.

Is there voltage present?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK THE SCR RELAY 2 (K402) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the PDC C3 harness connector.
2. Measure the voltage on the SCR Relay 2 (K402) Control circuit at the PCM C1 harness connector.

Is there voltage present?

Yes

- Repair the SCR Relay 2 (K402) Control circuit (between the PDC and the PCM) for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P05F8-00-REDUCTANT HEATER CONTROL MODULE PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- During DEF system actuation.

SET CONDITION

- The PCM determines that the time to receive a NOx sensor valid message is greater than a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND
DEF HCU GROUND CIRCUIT OPEN/HIGH RESISTANCE
DEF HEATER CONTROL UNIT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P20B9, P20BB, or P20BC active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE ASD (F343) SUPPLY CIRCUIT, (A914) FUSED B+ CIRCUIT AND THE (Z909) HCU GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the ignition on, engine off.
2. Measure the voltage across the ASD (F343) Supply circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector. Then, measure the voltage across the (A914) Fused B+ circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the ASD (F343) Supply circuit or the (A914) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE WIRE HARNESS AND CONNECTORS FOR DAMAGED

1. Turn the ignition off.
2. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF HCU and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL UNIT (HCU) FOR PROPER OPERATION

1. Replace the Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P05FF-00-BRAKE PRESSURE SENSOR / BRAKE PEDAL POSITION SENSOR CORRELATION

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- The Powertrain Control Module (PCM) detects a correlation issue between master cylinder sensor pressure and the pedal travel sensor based on CAN bus data from the Anti-Lock Brake System (ABS) Module.

POSSIBLE CAUSES

Possible Causes
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE RELATED DTCS
MECHANICAL BASE BRAKE SYSTEM
HYDRAULIC CONTROL UNIT (HCU)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR ANTI-LOCK BRAKE SYSTEM (ABS) MODULE OR COMMUNICATION RELATED DTCS

1. Refer to the recorded DTCS.

Are there any ABS Module or Communication related DTCS active?

Yes

- Perform the appropriate diagnostic procedures before continuing with this test. Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. MECHANICAL BASE BRAKE SYSTEM INSPECTION

1. Turn the ignition off.
2. Check the brake fluid level.
3. Check the brake fluid for contaminants.
4. Check base brake issues.
5. Visually inspect the master cylinder and all brake line fittings.

6. Visually inspect the brake lines between the Brake Master Cylinder and the Hydraulic Control Unit (HCU) for bent, damaged, or pinched restrictions.

Were any problems found?

Yes

- Repair as necessary.
- Perform the ABS VERIFICATION TEST. Refer to [**ABS VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Turn the ignition off.
2. Disconnect the ABS Module harness connector.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

6. Connect the ABS Module harness connector. Be certain that the harness connector is fully seated and the connector lock is fully engaged.
7. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

WARNING: To avoid possible serious or fatal injury, check brake capability is available before road testing.

10. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read ABS Module DTCs.

Did the DTC return?

Yes

- Replace the Power Brake Booster in accordance with the Service Information. Refer to **BOOSTER, POWER BRAKE, REMOVAL AND INSTALLATION** .
- Perform ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

No

- Perform ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .
- Test complete.

P0605-00-INTERNAL CONTROL MODULE ROM

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS**.

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0606-00-INTERNAL CONTROL PROCESSOR

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0607-00-ECU INTERNAL PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P060B-00-INTERNAL CONTROL MODULE A/D PROCESSING PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P060C-00-INTERNAL CONTROL MODULE MAIN PROCESSOR PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P060D-00-INTERNAL CONTROL MODULE ACCELERATOR PEDAL POSITION PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal error or the plausibility of the Accelerator Pedal Position Sensor.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any APP DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECKING THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0615-00-STARTER CONTROL CIRCUIT/OPEN

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Battery voltage greater than 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open condition in the starter relay control circuit.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
STARTER CONTROL CIRCUIT OPEN
STARTER RELAY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE STARTER RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Install a known good relay.

Does the engine start?

Yes

- Replace the Starter Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE STARTER RELAY (K8) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Remove the Starter Relay.
4. Measure the resistance of the Starter Relay (K8) Control circuit between the Starter Relay Control terminal and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Starter Relay (K8) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0616-00-STARTER CONTROL CIRCUIT LOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects no voltage on the (T752) Starter Relay Control circuit for 0.05 second.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
STARTER RELAY CONTROL CIRCUIT SHORTED TO GROUND
STARTER RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
STARTER RELAY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE STARTER RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Starter Relay with a known good relay.
3. Attempt to start the engine several times.
4. Monitor the scan tool for at least two minutes.
5. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [3](#)

No

- Replace the Starter Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE STARTER RELAY (T752) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the Starter Relay.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the Starter Relay (T752) Control circuit at the Starter Relay connector (terminal 86).

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Starter Relay (T752) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE STARTER RELAY (T752) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Starter Relay (T752) Control circuit between the Starter Relay connector (terminal 86) and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Starter Relay (T752) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0617-00-STARTER CONTROL CIRCUIT HIGH

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to voltage on the Starter Relay Control circuit for 0.5 second.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
STARTER RELAY
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE STARTER RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Starter Relay with a known good relay.
3. Attempt to start the engine several times.
4. Monitor the scan tool for at least two minutes.
5. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [3](#)

No

- Replace the Starter Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE STARTER RELAY (T752) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Remove the Starter Relay.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the Starter Relay (T752) Control circuit and all other circuits at the PCM C1 harness connector.

Is the resistance above 10k Ohms between the Starter Relay (T752) Control circuit and all other circuits?

Yes

- Go To [4](#)

No

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).
- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P061B-00-INTERNAL CONTROL MODULE TORQUE CALCULATION PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#) .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P061C-00-INTERNAL CONTROL MODULE ENGINE RPM PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS**.

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0627-00-FUEL PUMP CONTROL CIRCUIT OPEN

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine cranking or running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Fuel Pump Relay Control circuit for 0.5 second. This is a one Trip Fault.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

NOTE: The Battery supply for the Fuel Pump Relay coil is supplied by the Run/Start Relay output.

1. Refer to the recorded DTCs.

Are there any Run/Start Relay Control circuit DTCs present in any other modules?

Yes

- Perform the applicable diagnostic procedure(s).

No

- Go To [3](#)

3. CHECK THE FUEL PUMP RELAY CONFIGURATION

1. Check the PDC layout in the wiring information to determine if the Fuel Pump Relay is removable or a Printed Circuit Board (PCB) Relay in the PDC.

What type of relay is the vehicle configured with?

Removable Relay

- Go To [4](#)

PCB Relay

- Go To [5](#)

4. CHECK THE RUN/START OUTPUT TO THE FUEL PUMP RELAY CONTROL COIL

1. Turn the ignition off.
2. Remove the Fuel Pump Relay from the relay connector in the PDC.
3. Turn the ignition on.
4. Using a 12-volt test light connected to ground, probe the Battery supply voltage from the Run/Start Relay Output at terminal 85 at the Fuel Pump Relay connector in the PDC.

Is the test light illuminated and bright?

Yes

- Go To [6](#)

No

- Check all of the fuses in the PDC. If a fuse is open, replace the fuse and retest. If no problems are found with the fuses, check the Battery supply to the PDC and the operation of the Run/Start Relay. If no problems are found replace the PDC in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK FOR THE RUN/START OUTPUT VOLTAGE TO THE FUEL PUMP RELAY CONTROL COIL

1. Using a DMM, back probe and measure the voltage on the Fuel Pump (K31) Control circuit at the PDC connector.

NOTE: The relay must be commanded off when checking for voltage on the circuit. With the relay Low Side Driver control circuit commanded off the voltage should be approximately equal to Battery voltage on the (K31) Fuel Pump Control circuit.

Is the voltage approximately equal to Battery voltage?

Yes

- Go To [6](#)

No

- Check all of the fuses in the PDC. If a fuse is open, replace the fuse and retest. If no problems are found with the fuses, check the Battery supply to the PDC and the operation of the Run/Start Relay. If no problems are found replace the PDC in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE FUEL PUMP RELAY FOR PROPER OPERATION

1. If the relay is removable, reinstall the Fuel Pump Relay in the PDC.
2. Turn the ignition on.
3. Using a 12-volt test light connected to ground, back probe the Fuel Pump (K31) Control circuit at the PDC connector.

NOTE: The relay should make an audible click when closing. Another way to verify that the relay closed is to back probe and check for voltage on the relay output circuit.

Did the relay close when connecting the Fuel Pump (K31) Control circuit to ground through the test light?

Yes

- Go To [7](#)

No

- If this is a PCB relay, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- If this is a removable relay and the PDC has an internal PCB and harness connectors, isolate and check the continuity between terminal 86 of the relay connector and the output terminal at the PDC connector. If the resistance is below 3.0 Ohms, replace the Fuel Pump Relay. If the resistance is above 3.0 Ohms, replace the Power Distribution Center (PDC) in accordance with the Service Information.
- If this is a removable relay and the wiring harness is directly hard wired into the PDC, replace the Vacuum Pump Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. ISOLATE AND CHECK THE FUEL PUMP (K31) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PCM and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DVOM to the circuit being tested at the PCM harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [8](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK THE SUPPLY VOLTAGE TO THE FUEL PUMP

1. Turn the engine off.
2. Reconnect the PDC harness connector.
3. Reconnect the PCM harness connector.
4. Disconnect the Fuel Pump harness connector.
5. Turn the ignition on, engine off.
6. Measure the voltage across the Fuel Pump (N1) Control Output circuit and the (Z916) Fuel Pump Ground circuit at the Fuel Pump harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [10](#)

No

- Go To [9](#)

9. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.

2. Measure the resistance between ground and the (Z916) Fuel Pump Ground circuit at the Fuel Pump harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z916) Fuel Pump Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. ISOLATE AND CHECK THE FUEL PUMP (N1) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the PDC and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [11](#)

11. ISOLATE AND CHECK THE FUEL PUMP (N1) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the PDC and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DMM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DMM to the circuit being tested at the component harness connector.
5. Connect the other lead of the DMM to the circuit being tested at the PDC harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [12](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

12. CHECK THE FUEL PUMP OPERATION

1. Replace the Fuel Pump in accordance with the Service Information.
2. Connect the Fuel Pump and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [**13**](#)

No

- Replacing the Fuel Pump repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

13. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repairing the poor connections repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0628-00-FUEL PUMP CONTROL CIRCUIT LOW

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine cranking or running

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Fuel Pump Relay Control circuit.

DEFAULT ACTION

- MIL is illuminated on the second consecutive trip that the diagnostic fails.
- The MIL will be turned off on the third consecutive trip that the diagnostic passes.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUEL PUMP (K31) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between ground and the Fuel Pump (K31) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Go To [3](#)

3. CHECK THE FUEL PUMP (K31) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the PDC harness connectors.
2. Measure the resistance between ground and the Fuel Pump (K31) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the Fuel Pump (K31) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P0629-00 To P1222-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P0629-00-FUEL PUMP CONTROL CIRCUIT HIGH

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine cranking or running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to voltage on the Fuel Pump Relay Control circuit for 0.5 second. This is a one Trip Fault.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE FUEL PUMP (K31) CONTROL CIRCUIT FOR A SHORT TO ALL OTHER CIRCUITS IN THE PCM C1 CONNECTOR

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Disconnect the PDC harness connectors.
4. Measure the resistance between the Fuel Pump (K31) Control circuit and all other circuits at the PCM C1 harness connector.

Is the resistance below 10k Ohms between the Fuel Pump (K31) Control circuit and any other circuits?

Yes

- Repair the Fuel Pump (K31) Control circuit for a short to the other circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE POWER DISTRIBUTION CENTER (PDC) FOR PROPER OPERATION

1. Replace the Power Distribution Center in accordance with the Service Information.
2. Ignition on, engine not running.
3. With the scan tool, erase DTCs in the PCM.
4. Crank the engine for no more than 10 seconds if it will not start.
5. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P062A-00-FUEL PUMP A CONTROL CIRCUIT RANGE-PERFORMANCE

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Pulse-Width Modulation (PWM) cycle percentage is outside a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FPCM PWM CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FPCM PWM FEEDBACK CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
FUEL PUMP CONTROL MODULE (FPCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE FPCM PWM (N11) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. ISOLATE AND CHECK THE FPCM PWM (N12) FEEDBACK CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE FUEL PUMP CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P062B-00-INTERNAL CONTROL MODULE FUEL INJECTOR CONTROL CIRCUIT PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an error in the Fuel Injector energizing device.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCS.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P062D-00-FUEL INJECTOR DRIVER CIRCUIT PERFORMANCE BANK 1

For a complete FUEL CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a failure in multiple Fuel Injector Control circuits within Bank 1 for calibrated amount of time. This is a one Trip Fault

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTORS/BANK 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Fuel Injector 1, 2, & 3 harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High-Side Control circuit (for Injectors 1, 2, & 3).

Is the voltage at or above Battery voltage for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE FUEL INJECTORS/BANK 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace Fuel Injectors 1, 2, and 3 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P062E-00-FUEL INJECTOR DRIVER CIRCUIT PERFORMANCE BANK 2

For a complete FUEL CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects a failure in multiple Fuel Injector Control circuits within Bank 2 for calibrated amount of time. This is a one Trip Fault.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL INJECTORS/BANK 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any other Fuel Injector DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE BANK 2 FUEL INJECTOR CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Fuel Injector 4, 5, & 6 harness connectors.
3. Disconnect the PCM C2 harness connector.
4. Remove the ASD Relay from the PDC.
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of each Fuel Injector High-Side Control circuit (for Injectors 4, 5, & 6).

Is the voltage at or above Battery voltage for any of the measurements?

Yes

- Repair the appropriate Fuel Injector Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUEL INJECTORS/BANK 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace Fuel Injectors 4, 5, and 6 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCS.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P062F-00-INTERNAL CONTROL MODULE EEPROM ERROR

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0641-00-SENSOR REFERENCE VOLTAGE 1 CIRCUIT

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the voltage on the 5-Volt Sensor Supply 1 circuit is below 4.7 Volts or above 5.3 Volts for 0.10 second.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
AC PRESSURE SENSOR
BOOST PRESSURE/INTAKE AIR TEMPERATURE SENSOR 2
CAMSHAFT POSITION SENSOR
SWIRL VALVE
EGR POSITION SENSOR
FUEL RAIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

NOTE: Improperly installed aftermarket accessories can cause this DTC to set.

1. Refer to the recorded DTCs.

Are there any improperly installed aftermarket accessories DTCs present?

Yes

- Remove the aftermarket accessories and retest for DTC.

No

- Go To [3](#)

3. CHECK THE (C818) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the AC Pressure sensor harness connector.
3. Measure the voltage.

What is the measured voltage?

- Go To [7](#)

The voltage is more than 5.2 volts.

- Go To [8](#)

The voltage is less than 4.8 volts.

- Go To [4](#)

4. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

- 1. IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the (C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains low after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.
2. Disconnect the Boost Pressure Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
3. Disconnect the Camshaft Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
4. Disconnect the EGR Valve harness connector and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the Fuel Rail Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.
6. Disconnect the Swirl Valve Sensor harness connectors and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO GROUND

1. Check for continuity between ground and the 5-Volt Supply circuits.

Is there continuity between ground and the 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [6](#)

6. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO A SENSOR GROUND CIRCUIT AT EACH SENSOR CONNECTOR

1. Check for continuity between both all 5-Volt Supply circuits and the sensor ground circuits of each disconnected components.

Is there continuity between any of the sensor ground circuits and the Primary 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to the sensor ground circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [10](#)

7. REPLACE THE AC PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the AC Pressure Switch in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes.

- Disconnect and measure the (C818) 5-volt supply circuit.
- If the voltage is more than 5.2 volts. Go To [8](#)
- If the voltage is less than 4.8 volts. Go To [4](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

1. **IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the (C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains high after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.
2. Disconnect the Boost Pressure Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
3. Disconnect the Camshaft Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
4. Disconnect the EGR Valve harness connector and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the Fuel Rail Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.
6. Disconnect the Swirl Valve Sensor harness connectors and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. ISOLATE AND CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0645-00-A/C CLUTCH CONTROL CIRCUIT

For a complete A/C CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the A/C Clutch Relay command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects the A/C Clutch Relay Control circuit voltage is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C CLUTCH RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
A/C CLUTCH RELAY
POWER DISTRIBUTION CENTER (PDC)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE A/C CLUTCH RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the A/C Clutch Relay (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCS in the PCM.
5. Start the engine or crank the engine for 10 seconds.
6. With the scan tool, select View DTCS.

Did the DTC return?

Yes

- Go To [3](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE BETWEEN THE PCM AND THE A/C CLUTCH RELAY TERMINAL

1. Turn the ignition off.
2. Remove the A/C Clutch Relay from the Power Distribution Center (PDC).
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the A/C Clutch (C13) Control circuit between the PCM C1 harness connector and the A/C Clutch Relay terminal.

Is the resistance above 5.0 Ohms?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE BETWEEN THE PCM AND THE PDC

1. Disconnect the PDC harness connectors.
2. Measure the resistance of the A/C Clutch (C13) Control circuit between the PCM C1 harness connector and the PDC harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the A/C Clutch (C13) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0646-00-A/C CONTROL CIRCUIT LOW

For a complete A/C CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the A/C Clutch Relay command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects the A/C Clutch Relay Control circuit voltage is lower than a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND
A/C CLUTCH RELAY
POWER DISTRIBUTION CENTER (PDC)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE A/C CLUTCH RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the A/C Clutch Relay (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Start the engine or crank the engine for 10 seconds.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [3](#).

No

- Replace the A/C Clutch Relay.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the A/C Clutch Relay from the Power Distribution Center (PDC).
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the A/C Clutch (C13) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE POWER DISTRIBUTION CENTER (PDC) FOR PROPER OPERATION

1. Disconnect the PDC harness connectors.
2. Measure the resistance between ground and the A/C Clutch (C13) Control circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the A/C Clutch (C13) Control circuit for a short ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0647-00-A/C CONTROL CIRCUIT HIGH

For a complete A/C CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the A/C Clutch Relay command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects the A/C Clutch Relay Control circuit voltage is higher than a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
A/C CLUTCH RELAY
POWER DISTRIBUTION CENTER (PDC)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE A/C CLUTCH RELAY FOR PROPER OPERATION

1. Turn the ignition off.

2. Replace the A/C Clutch Relay (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Start the engine or crank the engine for 10 seconds.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [3](#).

No

- Replace the A/C Clutch Relay in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR A SHORT TO ALL OTHER CIRCUITS IN PCM C1 CONNECTOR

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between the A/C Clutch (C13) Control circuit and all other circuits at the PCM C1 harness connector.

Is the resistance above 10k Ohms between the A/C Clutch (C13) Control circuit and all other circuits?

Yes

- Go To [5](#)

No

- Go To [4](#)

4. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR A SHORT TO ANY OTHER CIRCUITS IN THE PCM C1 CONNECTOR

1. Disconnect the PDC harness connectors.
2. Measure the resistance between the A/C Clutch (C13) Control circuit and all other circuits at the PCM C1 harness connector.

Is the resistance above 10k Ohms between the A/C Clutch (C13) Control circuit and all other circuits?

Yes

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the A/C Clutch (C13) Control circuit for a short to the circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P064D-00-INTERNAL CONTROL MODULE O2 SENSORS PROCESSOR PERFORMANCE - BANK 1

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement

chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Powertrain Control Module (PCM) monitors the exhaust gases for oxygen content and varies the rich/lean fuel mixture of the intake air fuel mixture to adjust the system. This self-diagnostics program monitors the O2 processor operation internal to the PCM. The PCM will illuminate the MIL lamp when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects an implausible voltage on the PCM O2 Sensor Internal Processor for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any other O2 Sensor DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE O2 SENSOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Oxygen Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.
7. With the scan tool, read PCM DTCS.

Does the scan tool display this DTC?

Yes

- Go To [**4**](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P0651-00-SENSOR REFERENCE VOLTAGE 2 CIRCUIT

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a low voltage on the Sensor Supply 2 circuit for 0.10 second.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE OR GROUND
ACCELERATOR PEDAL POSITION (APP) SENSOR 1
CRANKCASE PRESSURE SENSOR
DIFFERENTIAL PRESSURE SENSOR
LOW PRESSURE FUEL LINE PRESSURE SENSOR
LP EGR PRESSURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

NOTE: Improperly installed aftermarket accessories can cause this DTC to set.

1. Refer to the recorded DTCS.

Are there any improperly installed aftermarket accessories DTCS present?

Yes

- Remove the aftermarket accessories and retest for DTC.

No

- Go To [3](#)

3. CHECK THE (F860) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Crankcase Pressure sensor harness connector.
3. Measure the voltage.

What is the measured voltage?

- Go To [8](#)

The voltage is more than 5.2 volts.

- Go To [9](#)

The voltage is less than 4.8 volts.

- Go To [4](#)

4. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

1. **IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the (C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains low after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.
2. Disconnect the Accelerator Pedal Position (APP) Sensor 1 harness connector and check the Primary 5-Volt Supply circuit voltage.
3. Disconnect the Differential Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.
4. Disconnect the Low Pressure Fuel Line Pressure Sensor harness connectors and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the EGR Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.

NOTE: All of the components should still be disconnected during this test step.

2. Disconnect the PCM C1 harness connector from the PCM.
3. Check for continuity between ground and the 5-Volt Supply circuits.

Is there continuity between ground and the any 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [6](#)

6. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO GROUND

1. Check for continuity between ground and the 5-Volt Supply circuits.

Is there continuity between ground and the 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO A SENSOR GROUND CIRCUIT AT EACH SENSOR CONNECTOR

1. Check for continuity between both all 5-Volt Supply circuits and the sensor ground circuits of each disconnected components.

Is there continuity between any of the sensor ground circuits and the Primary 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to the sensor ground circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [11](#)

8. REPLACE THE CRANKCASE PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Crankcase Pressure Switch in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes.

- Disconnect and measure the (F860) 5-volt supply circuit.
- If the voltage is more than 5.2 volts. Go To [9](#)
- If the voltage is less than 4.8 volts. Go To [4](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

1. **IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the

(C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains high after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.

2. Disconnect the Accelerator Pedal Position (APP) Sensor 1 harness connector and check the Primary 5-Volt Supply circuit voltage.
3. Disconnect the Differential Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.
4. Disconnect the Low Pressure Fuel Line Pressure Sensor harness connectors and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the EGR Pressure harness connector and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [11](#)

11. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.

5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0658-00-ACTUATOR SUPPLY VOLTAGE "A" CIRCUIT LOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the internal actuator supply voltage is low for 0.05 second.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PCM POWERS AND GROUNDS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0659-00-ACTUATOR SUPPLY VOLTAGE "A" CIRCUIT HIGH

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the internal actuator supply voltage is high for 0.05 of a second.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
PCM POWERS AND GROUNDS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS** .

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P065B-00-GENERATOR CONTROL CIRCUIT PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running and Battery voltage greater than 10.4 volts.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the actual state of the generator field control does not match the intended state.

DEFAULT ACTION

- Battery light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

POSSIBLE CAUSES
GENERATOR LIN BUS CIRCUIT SHORTED TO VOLTAGE
GENERATOR LIN BUS CIRCUIT SHORTED TO GROUND
GENERATOR LIN BUS CIRCUIT OPEN OR HIGH RESISTANCE
GENERATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Start the engine and allow it to reach normal operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts or fan. Do not wear loose clothing. Failure to follow these instructions may result in possible serious or fatal injury.

2. With the scan tool, read DTCs.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GENERATOR LIN BUS CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Generator harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the Generator LIN BUS circuit and all other circuits at the PCM C1 harness connector.

Did the Generator LIN BUS circuit measure above 10k Ohms to all other circuits?

Yes

- Go To [3](#)

No

- Repair the Generator LIN BUS circuit for a short to the PCM C1 circuit that measured below 10k Ohms.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

3. CHECK THE GENERATOR LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the Generator LIN BUS circuit at the Generator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Generator LIN BUS circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE GENERATOR LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Generator LIN BUS circuit between the Generator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the Generator LIN BUS circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. GENERATOR

1. Connect the PCM C1 harness connector.
2. Turn the ignition on.
3. With the scan tool, actuate the Generator field control to the ON (100%) position.
4. Using a 12-volt test light connected to ground, check the Generator LIN BUS circuit in the Generator harness connector.

NOTE: **The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.**

5. With the scan tool, actuate the Generator field control to the OFF (0%) position.
6. Using a 12-volt test light connected to ground, check the (K509) Generator LIN BUS circuit at the Generator harness connector.

NOTE: **The test light should not be illuminated.**

Is the test light illuminated and bright with the actuation ON (100%) and not illuminated with the actuation OFF (0%)?

Yes

- Replace the Generator in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. POWERTRAIN CONTROL MODULE (PCM)

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Generator and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P066A-00-CYLINDER 1 GLOW PLUG CIRCUIT LOW

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to ground on the Cylinder 1 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO GROUND

Possible Causes
GLOW PLUG 1
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GLOW PLUG 1 (A202) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the Glow Plug 1 (A202) Control circuit at the Glow Plug 1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 1 (A202) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P066B-00-CYLINDER 1 GLOW PLUG CIRCUIT HIGH

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 1 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 1
GLOW PLUG MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GLOW PLUG 1 (A202) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Glow Plug 1 (A202) Control circuit at the Glow Plug 1 harness connector.

Is there voltage present?

Yes

- Repair the Glow Plug 1 (A202) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.

2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P066C-00-CYLINDER 2 GLOW PLUG CIRCUIT LOW

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Cylinder 2 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG 2
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GLOW PLUG 2 (A203) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Measure the resistance between ground and the Glow Plug 2 (A203) Control circuit at the Glow Plug 2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 2 (A203) Control circuit for a short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

3. CHECK THE GLOW PLUG 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P066D-00-CYLINDER 2 GLOW PLUG CIRCUIT HIGH

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 2 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 2
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE GLOW PLUG 2 (A203) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 2 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Glow Plug 2 (A203) Control circuit at the Glow Plug 2 harness connector.

Is there voltage present?

Yes

- Repair the Glow Plug 2 (A203) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P066E-00-CYLINDER 3 GLOW PLUG CIRCUIT LOW

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Cylinder 3 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG 3
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE GLOW PLUG 3 (A204) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Measure the resistance between ground and the Glow Plug 3 (A204) Control circuit at the Glow Plug 3 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 3 (A204) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE GLOW PLUG 3 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P066F-00-CYLINDER 3 GLOW PLUG CIRCUIT HIGH

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 3 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 3 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 3
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#).

2. CHECK THE GLOW PLUG 3 (A204) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 3 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Glow Plug 3 (A204) Control circuit at the Glow Plug 3 harness connector.

Is there voltage present?

Yes

- Repair the Glow Plug 3 (A204) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [3](#)

3. CHECK THE GLOW PLUG 3 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0671-00-CYLINDER 1 GLOW PLUG CIRCUIT OPEN

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs DO NOT tolerate any over voltage. Full battery voltage will destroy the glow plug immediately. DO NOT test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.

3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

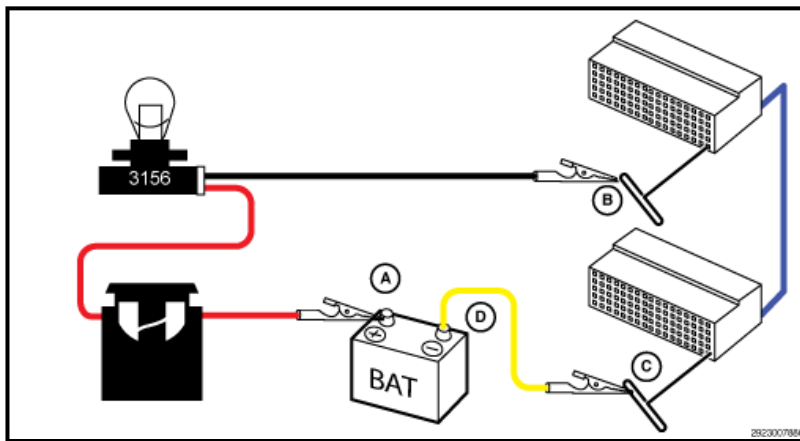
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 1 (A202) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 1 (A202) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

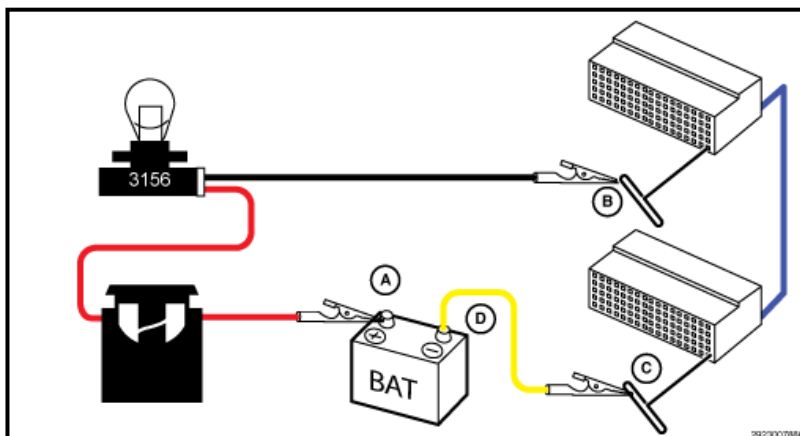
- Repair the Glow Plug 1 (A202) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the

bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.
- Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0672-00-CYLINDER 2 GLOW PLUG CIRCUIT OPEN

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs **DO NOT** tolerate any over voltage. Full battery voltage will destroy the glow plug immediately. **DO NOT** test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.
3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

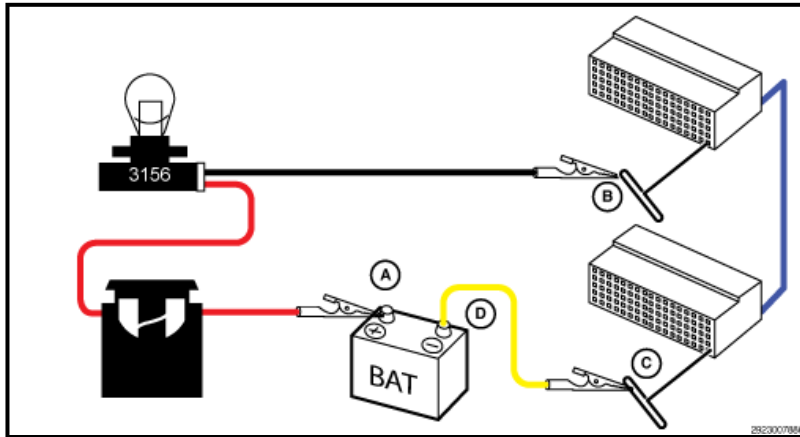
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 2 (A203) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 2 (A203) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

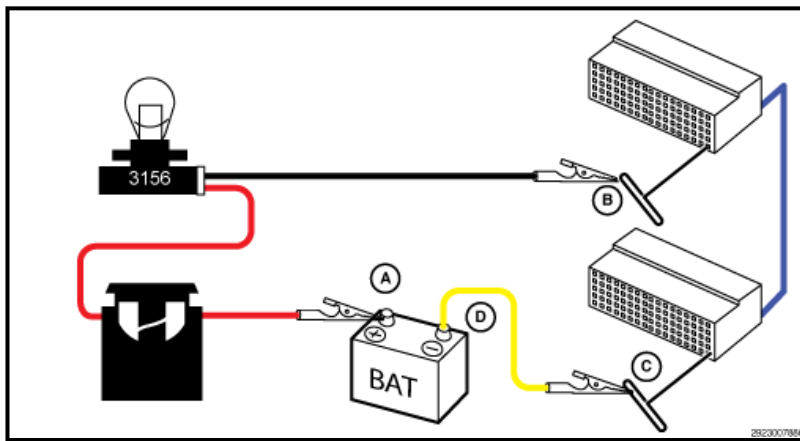
- Repair the Glow Plug 2 (A203) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.
 - Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P0673-00-CYLINDER 3 GLOW PLUG CIRCUIT OPEN

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs **DO NOT** tolerate any over voltage. Full battery voltage will destroy the glow plug immediately. **DO NOT** test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.
3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

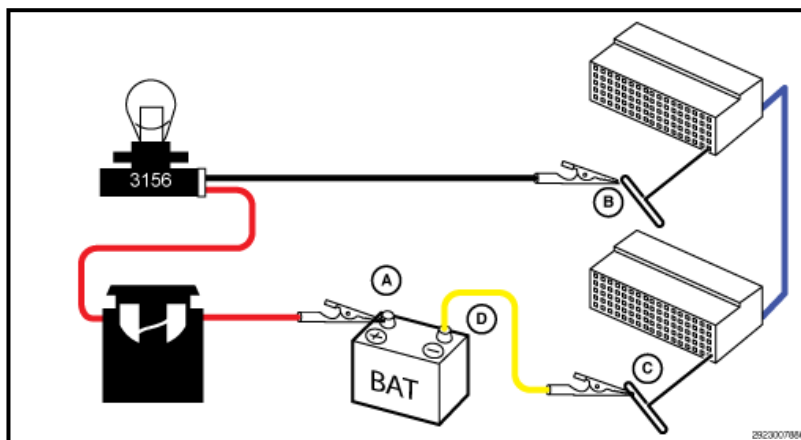
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 3 (A204) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 3 (A204) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

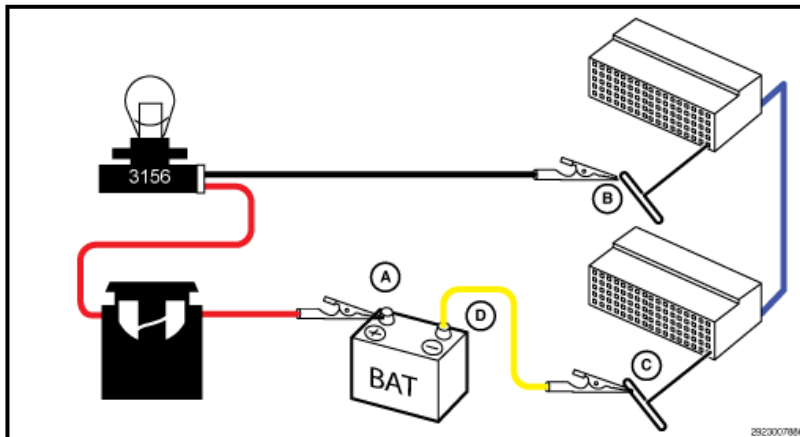
- Repair the Glow Plug 3 (A204) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.
 - Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0674-00-CYLINDER 4 GLOW PLUG CIRCUIT OPEN

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs DO NOT tolerate any over voltage. Full battery voltage will destroy the glow plug immediately. DO NOT test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.
3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [TESTING FOR AN INTERMITTENT CONDITION](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are DTCS P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

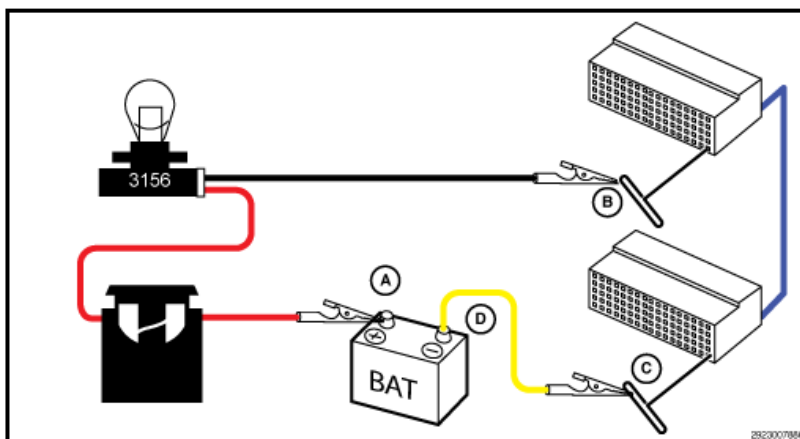
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 4 (A208) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 4 (A208) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the

bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

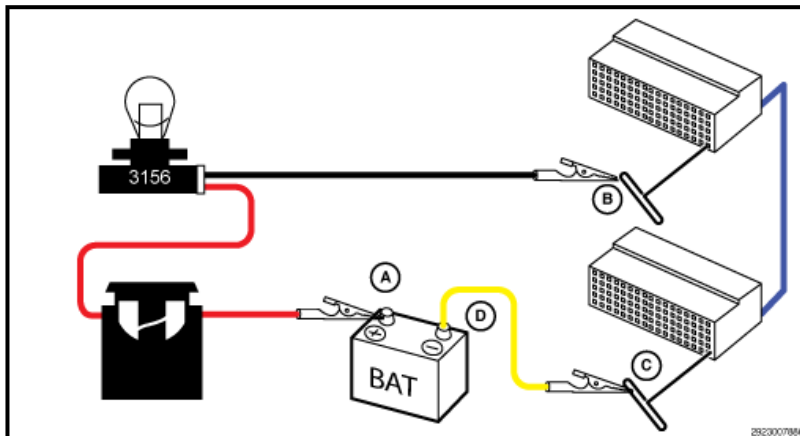
- Repair the Glow Plug 4(A208) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.
 - Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0675-00-CYLINDER 5 GLOW PLUG CIRCUIT OPEN

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs DO NOT tolerate any over voltage. Full battery voltage will destroy the glow plug

immediately. DO NOT test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.
3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

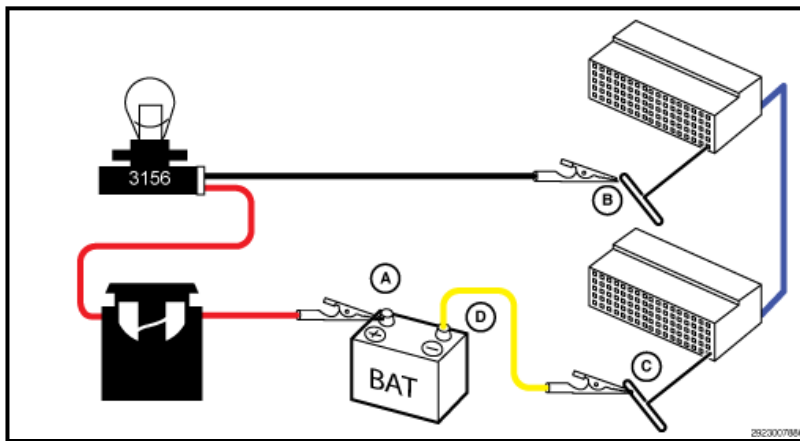
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 5 (A211) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 5 (A211) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

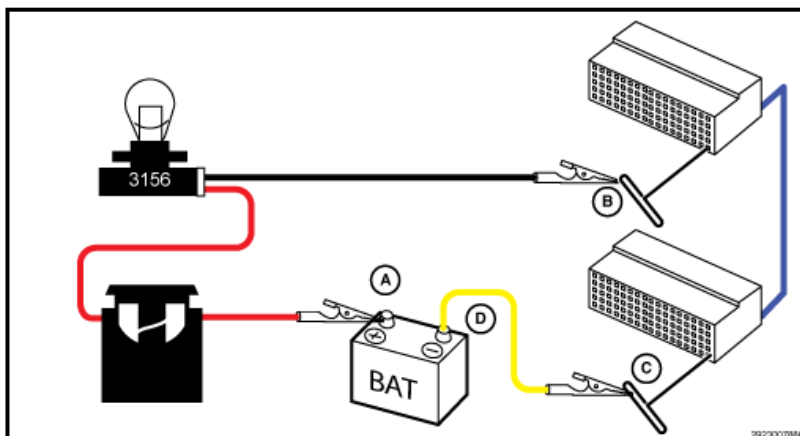
- Repair the Glow Plug 5 (A211) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the

bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.
- Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P0676-00-CYLINDER 6 GLOW PLUG CIRCUIT OPEN

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the Glow Plug circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN

CAUTION: The glow plugs operate on a 7-volt system. The glow plugs **DO NOT** tolerate any over voltage. Full battery voltage will destroy the glow plug immediately. **DO NOT** test the glow plugs with a 12V source as damage will occur to the glow plug.

Using the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

1. For future reference, using the scan tool, run and save a Vehicle Scan Report and all recorded data.
2. With the scan tool, erase all DTCs.
3. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds.
4. Turn the ignition on.
5. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle under the conditions that set the DTC.
6. Using the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P052F-00, P0683-00, U0106-00, U0407-00, or any other Glow Plug Module Performance fault codes active or pending?

Yes

- Perform the applicable diagnostic procedure(s) for those Diagnostics before continuing with this one. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

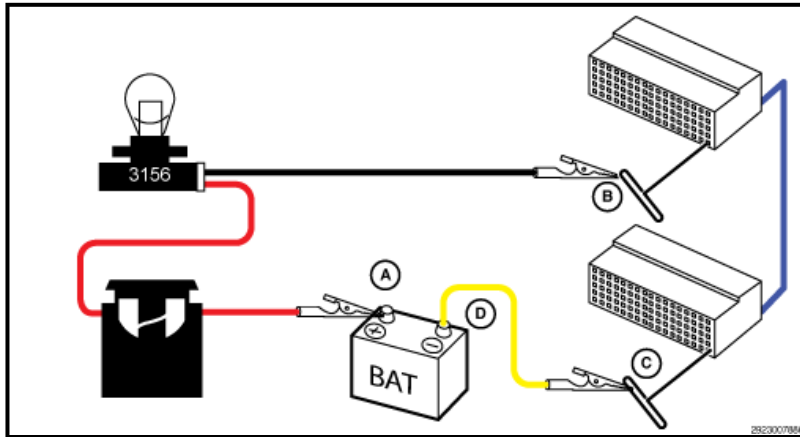
- Go To [3](#)

3. ISOLATE AND LOAD TEST THE GLOW PLUG 6 (A216) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Turn the ignition off.
2. Disconnect the Glow Plug harness connector.
3. Disconnect the Glow Plug Module harness connector.
4. Load test the Glow Plug 6 (A216) Control circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

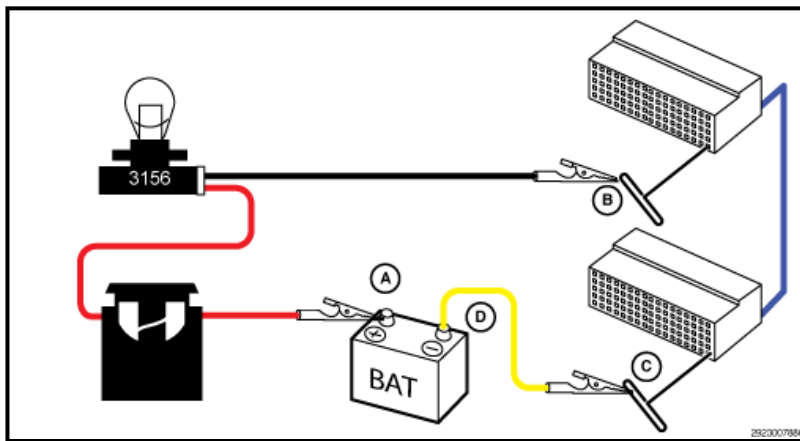
- Repair the Glow Plug 6 (A216) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. ISOLATE AND LOAD TEST THE (A29) FUSED B+ CIRCUIT TO CHECK FOR HIGH RESISTANCE

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES** .

CAUTION: Do not load test any circuits with components still connected to the circuit.

1. Load test the (A29) Fused B+ circuit. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [5](#)

No

- Repair the (A29) Fused B+ circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE GLOW PLUG 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Replacing the Glow Plug repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED GLOW PLUG MODULE HARNESS CONNECTIONS

1. Disconnect the Glow Plug Module harness connector.
2. Disconnect all related in-line harness connections (if equipped).

NOTE: There are several component harnesses connected to the Glow Plug Module including: The Glow Plugs, the PDC, and the PCM.

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.
 - Look for any chafed, pierced, pinched, or partially broken wires.

Repair any conditions that are found.

5. Connect the Glow Plug Module harness connector. Be certain that all connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
8. Using the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the When Monitored and Set Conditions.
10. With the scan tool, read DTCs.

Did the DTC return as Active or Pending?

Yes

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P067A-00-CYLINDER 4 GLOW PLUG CIRCUIT LOW

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Cylinder 4 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG 4
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GLOW PLUG 4 (A208) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Measure the resistance between ground and the Glow Plug 4 (A208) Control circuit at the Glow Plug 4 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 4 (A208) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE GLOW PLUG 4 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P067B-00-CYLINDER 4 GLOW PLUG CIRCUIT HIGH

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow

Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 4 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 4 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 4
GLOW PLUG MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GLOW PLUG 4 (A208) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 4 harness connector.
3. Turn the ignition on.

4. Measure the voltage on the Glow Plug 4 (A208) Control circuit at the Glow Plug 4 harness connector.

Is there voltage present?

Yes

- Repair the Glow Plug 4 (A208) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. GLOW PLUG 4

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. GLOW PLUG MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Cylinder 5 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 5 CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG 5
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE GLOW PLUG 5 (A211) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Measure the resistance between ground and the Glow Plug 5 (A211) Control circuit at the Glow Plug 5 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 5 (A211) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. GLOW PLUG 5

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. GLOW PLUG MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P067D-00-CYLINDER 5 GLOW PLUG CIRCUIT HIGH

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 5 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 5 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 5
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE GLOW PLUG 5 (A211) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 5 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Glow Plug 5 (A211) Control circuit at the Glow Plug 5 harness connector.

Is there voltage present?

Yes

- Repair the) Glow Plug 5 (A211 Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. GLOW PLUG 5

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. GLOW PLUG MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P067E-00-CYLINDER 6 GLOW PLUG CIRCUIT LOW

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects a short to ground on the Cylinder 6 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 6 CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG 6
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE GLOW PLUG 6 (A216) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Measure the resistance between ground and the Glow Plug 6 (A216) Control circuit at the Glow Plug 6 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Glow Plug 6 (A216) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. GLOW PLUG 6

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. GLOW PLUG MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plugs and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.

4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P067F-00-CYLINDER 6 GLOW PLUG CIRCUIT HIGH

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a short to voltage on the Cylinder 6 Glow Plug circuit.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG 6 CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG 6
GLOW PLUG MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE GLOW PLUG 6 (A216) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Glow Plug 6 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Glow Plug 6 (A216) Control circuit at the Glow Plug 6 harness connector.

Is there voltage present?

Yes

- Repair the Glow Plug 6 (A216) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. GLOW PLUG 6

1. Turn the ignition off.
2. Replace the Glow Plug in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. GLOW PLUG MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug and the Glow Plug Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0683-00-GLOW PLUG CONTROL MODULE 1 TO PCM COMMUNICATION CIRCUIT

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Glow Plug Module for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GENERATOR
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT SHORTED TO VOLTAGE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND
GLOW PLUG MODULE GROUND CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE GENERATOR FOR PROPER OPERATION

1. Turn the ignition off. Leave it off for 5 minutes.
2. Disconnect the Generator Module harness connector.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Crank the engine for no more than 10 seconds if it will not start.
6. With the scan tool, select View DTCs.

Is DTC P0683-00, U0106-00, or U0407-00 active?

Yes

- If it is this DTC that reset, Go To [3](#)
- If it is one of the other two DTCs that reset, perform the Diagnostics for those DTCs before continuing with this one.

No

- Replace the Generator in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE PCM C1 CONNECTOR HARNESS

1. Turn the ignition off.
2. Disconnect the Glow Plug Module harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D511) LIN Bus circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [4](#)

No

- Repair the (D511) LIN Bus circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D511) LIN Bus circuit at the Glow Plug Module harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the (D511) LIN Bus circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN Bus circuit between the Glow Plug Module harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D511) LIN Bus circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE (F343) ASD SUPPLY CIRCUIT, (A29) FUSED B+ CIRCUIT AND THE (Z909) GLOW PLUG MODULE GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the engine on.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector. Then, measure the voltage across the (A29) Fused B+ circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit or the (A29) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [7](#)

7. CHECK THE GLOW PLUG MODULE WIRE HARNESS AND CONNECTORS FOR DAMAGE

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug Module and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [8](#)

8. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Replace the Glow Plug Module in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Turn the ignition off. Leave the ignition off for 5 minutes.
5. Start the engine.
6. Allow the engine to run for 2 minutes.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [9](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P068A-00-PCM POWER DE-ENERGIZED PERFORMANCE - TOO EARLY

THEORY OF OPERATION

When the ignition switch is turned off, the Powertrain Control Module (PCM) continues to drive the ASD relay on for approximately 20-40 seconds. This period of time is the After-Run Mode of operation. During After-Run

the PCM performs several internal and external checks. When After-Run is complete, the PCM switches off the ASD relay driver and powers off the engine system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the ignition is turned off.
- During after-run mode of operation.

SET CONDITION

- The internal Powertrain Control Module (PCM) timer determines that the ASD Relay has shut off before the AFTER-RUN mode of operation has been completed.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
ASD RELAY
ASD RELAY CONTROL CIRCUIT OPEN INTERMITTENTLY
PCM POWER AND GROUND CIRCUITS
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ASD RELAY FOR PROPER OPERATION

1. Ignition off.

2. Install a known good relay in place of the ASD Relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Perform several ignition key cycles, pausing for at least one minute between each cycle.
6. Turn the ignition on.
7. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK FOR THE (K51) ASD RELAY CONTROL CIRCUIT FOR AN INTERMITTENT OPEN

1. Ignition off.
2. Remove the ASD Relay.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the ASD Relay Control circuit while wiggling the wiring harness and connectors between the PCM and the ASD Relay connector.

Did the resistance go above 5.0 Ohms at any time while wiggling the wiring harness and connectors?

Yes

- Repair the ASD Relay Control circuit for an intermittent open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Turn the ignition off
2. Install the ASD relay
3. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to [CHECKING THE PCM POWER AND GROUND CIRCUITS](#).

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P068B-00-ECM POWER DE-ENERGIZED PERFORMANCE - TOO LATE

THEORY OF OPERATION

When the ignition switch is turned off, the Powertrain Control Module (PCM) continues to drive the ASD relay on for approximately 20-40 seconds. This period of time is the After-Run Mode of operation. During After-Run the PCM performs several internal and external checks. When After-Run is complete, the PCM switches off the ASD relay driver and powers off the engine system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the ignition is turned off.
- During AFTER-RUN mode of operation.

SET CONDITION

- The internal PCM timer determines that the ASD Relay remains on beyond a calibrated threshold (amount of time) once AFTER-RUN mode of operation has been completed.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND
ASD RELAY OUTPUT CIRCUIT(S) SHORTED TO VOLTAGE
ASD RELAY
POWER DISTRIBUTION CENTER
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other PCM system DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE ASD RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Install a known good relay in place of the ASD Relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Perform several ignition key cycles, pausing for at least 40 seconds between each cycle.
6. Turn the ignition on.
7. With the scan tool, read ECM DTCs.

Did this DTC set again?

Yes

- Go To [**4**](#)

No

- Repair is complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK THE (K51) ASD RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Remove the ASD Relay from the PDC.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the (K51) ASD Relay Control circuit at the PCM C1 harness connector while wiggling the wiring harness and connectors.

Does the resistance remain above 10k Ohms while wiggling the wiring harness and connectors?

Yes

- Go To [**6**](#)

No

- Go To [**5**](#)

5. CHECK THE POWER DISTRIBUTION CENTER FOR PROPER OPERATION

1. Disconnect the PDC C3 harness connector.
2. Measure the resistance between ground and the (K51) ASD Relay Control circuit at the PCM C1 harness connector while wiggling the wiring harness and connectors.

Does the resistance remain above 10k Ohms while wiggling the wiring harness and connectors?

Yes

- Replace the Power Distribution Center in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the (K51) ASD Relay Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK THE ASD RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

1. Reconnect the PCM C1 harness connector.
2. Turn the ignition on.
3. Measure the voltage on the ASD Relay Output circuit at the ASD Relay Output terminal.

Is the voltage above 1.0 Volts?

Yes

- Go To [7](#)

No

- Go To [8](#)

7. CHECK THE POWER DISTRIBUTION CENTER FOR PROPER OPERATION

1. Turn the ignition off.
2. Disconnect the PDC C3 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the ASD Relay Output circuit at the ASD Relay Output terminal.

Is the voltage above 1.0 Volts?

Yes

- Replace the Power Distribution Center in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Refer to the Fuses/Relay-ASD Wiring Diagrams. Determine which of the 3 ASD Relay Output circuits (F342, F343, or F344) is above 1.0 Volts (with the ASD Relay disconnected) and repair that circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK THE PCM POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Turn the ignition off.
2. Reconnect the ASD Relay.
3. Refer to symptom CHECKING THE PCM POWER AND GROUNDS and verify proper Ignition, Battery and Ground circuits at the PCM.

Were any problem found with the PCM Ignition, Battery or Ground circuits?

Yes

- Repair or replace as necessary.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0691-00-COOLING FAN 1 CONTROL CIRCUIT LOW

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) sends a Pulse-Width Modulated (PWM) signal to the Cooling Fan Module to operate the Engine Cooling Fan. The PCM detects that the Cooling Fan Control circuit is below a calibrated voltage for a calibrated threshold of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
COOLING FAN CONTROL CIRCUIT SHORT TO GROUND
COOLING FAN MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK RADIATOR FAN (K173) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Disconnect the Cooling Fan Module harness connector.
4. Measure the resistance between ground and the Radiator Fan (K173) Control circuit at the Cooling Fan Module harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the Radiator Fan (K173) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P0692-00-COOLING FAN 1 CONTROL CIRCUIT HIGH

For a complete COOLING SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) sends a Pulse-Width Modulated (PWM) signal to the Cooling Fan Module to operate the Engine Cooling Fan. The PCM detects that the Cooling Fan Control circuit voltage is above a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
COOLING FAN CONTROL CIRCUIT SHORT TO VOLTAGE
COOLING FAN MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE RADIATOR FAN (K173) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Cooling Fan Module harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Radiator Fan (K173) Control circuit at the Cooling Fan Module harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Radiator Fan (K173) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P0697-00-SENSOR REFERENCE VOLTAGE 3 CIRCUIT

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects a low voltage on the Sensor Supply 3 circuit for 0.10 second.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE OR GROUND
ACCELERATOR PEDAL POSITION SENSOR (APP) 2
CRANKSHAFT POSITION SENSOR
EXHAUST MANIFOLD PRESSURE SENSOR
LP EGR POSITION SENSOR
LP EGR EXHAUST BYPASS VALVE
OIL TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

NOTE: Improperly installed aftermarket accessories can cause this DTC to set.

1. Refer to the recorded DTCs.

Are there any improperly installed aftermarket accessories DTCs present?

Yes

- Remove the aftermarket accessories and retest for DTC.

No

- Go To [3](#)

3. CHECK THE (K371) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Pressure sensor harness connector.
3. Measure the voltage.

What is the measured voltage?

- Go To [8](#)

The voltage is more than 5.2 volts.

- Go To [9](#)

The voltage is less than 4.8 volts.

- Go To [4](#)

4. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

1. **IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the (C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains low after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.
2. Disconnect the Accelerator Pedal Position (APP) 2 Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.

3. Disconnect the Crankshaft Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
4. Disconnect the LP EGR Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the Exhaust Bypass Valve harness connectors and check the Primary 5-Volt Supply circuit voltage.
6. Disconnect the Oil Temperature Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.

NOTE: All of the components should still be disconnected during this test step.

2. Disconnect the PCM C1 harness connector from the PCM.
3. Check for continuity between ground and the 5-Volt Supply circuits.

Is there continuity between ground and the any 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO GROUND

1. Check for continuity between ground and the 5-Volt Supply circuits.

Is there continuity between ground and the 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO A SENSOR GROUND CIRCUIT AT EACH SENSOR CONNECTOR

1. Check for continuity between both all 5-Volt Supply circuits and the sensor ground circuits of each disconnected components.

Is there continuity between any of the sensor ground circuits and the Primary 5-Volt Supply circuit(s)?

Yes

- Repair the 5-Volt Supply circuit for a short to the sensor ground circuit that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [11](#)

8. REPLACE THE EXHAUST GAS PRESSURE SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the Exhaust Gas Pressure Switch in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes.

- Disconnect and measure the (K371) 5-volt supply circuit.
- If the voltage is more than 5.2 volts. Go To [9](#)
- If the voltage is less than 4.8 volts. Go To [4](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

9. CHECK THE SENSORS THAT SHARE THE PRIMARY 5-VOLT SUPPLY

1. **IMPORTANT - FOLLOW THIS PROCEDURE EXACTLY WHEN CHECKING THE FOLLOWING COMPONENTS:** Turn the ignition off before disconnecting each component. After a component has been disconnected, turn the ignition on and measure the voltage on the (C818) 5-Volt Supply circuit. If the 5-Volt Supply voltage returns to 5.0 volts after disconnecting a component, the component that was disconnected is faulty. If the voltage remains high after disconnecting a component, then the disconnected component is not the problem. Leave each component disconnected and move on to the next until the faulty component is discovered or all components have been disconnected. Disconnect only one component at a time during this step.
2. Disconnect the Accelerator Pedal Position (APP) 2 Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
3. Disconnect the Crankshaft Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.

4. Disconnect the LP EGR Position Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.
5. Disconnect the Exhaust Bypass Valve harness connectors and check the Primary 5-Volt Supply circuit voltage.
6. Disconnect the Oil Temperature Sensor harness connector and check the Primary 5-Volt Supply circuit voltage.

Were any of the above components determined to be at fault?

Yes

- Replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [10](#)

10. ISOLATE AND CHECK THE 5-VOLT SUPPLY CIRCUITS FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [11](#)

11. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P06A0-00-VARIABLE AC COMPRESSOR CONTROL CIRCUIT

For a complete A/C CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the A/C Clutch Relay command off.

SET CONDITION

- The Powertrain Control Module (PCM) detects the A/C Clutch Relay Control circuit voltage is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
A/C CLUTCH RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
A/C CLUTCH RELAY
POWER DISTRIBUTION CENTER (PDC)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE A/C CLUTCH RELAY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the A/C Clutch Relay (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Start the engine or crank the engine for 10 seconds.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE BETWEEN THE PCM AND THE A/C CLUTCH RELAY TERMINAL

1. Turn the ignition off.

2. Remove the A/C Clutch Relay from the Power Distribution Center (PDC).
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the A/C Clutch (C13) Control circuit between the PCM C1 harness connector and the A/C Clutch Relay terminal.

Is the resistance above 5.0 Ohms?

Yes

- Go To [4](#)

No

- Go To [5](#)

4. CHECK THE A/C CLUTCH (C13) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE BETWEEN THE PCM AND THE PDC

1. Disconnect the PDC harness connectors.
2. Measure the resistance of the A/C Clutch (C13) Control circuit between the PCM C1 harness connector and the PDC harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the A/C Clutch (C13) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P06B9-00-CYLINDER 1 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P06BA-00-CYLINDER 2 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [**4**](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P06BB-00-CYLINDER 3 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P06BC-00-CYLINDER 4 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **[3.0L DIESEL - DIAGNOSTIC CODE INDEX](#)** .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P06BD-00-CYLINDER 5 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.

- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P06BE-00-CYLINDER 6 GLOW PLUG CIRCUIT PERFORMANCE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the Glow Plug Module Glow Plug command off.

SET CONDITION

- The PCM detects a resistance on the Glow Plug circuit above or below a calibrated threshold for a calibrated amount of time. This is a two trip fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GLOW PLUG

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Glow Plug Low/High/Lost Communication/or Invalid Data DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE GLOW PLUG FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Glow Plug using the proper application in accordance with the Service Information.

3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P06EA-00-NOX SENSOR 1/1 PROCESSOR PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM determines that the time to receive a NOx sensor valid message is greater than a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

NOTE: Verify that the correct application NOx Sensors are being used (and properly connected in their correct locations) before continuing with this Diagnostic tree.

NOTE: Verify that the Batteries and charging system are operating correctly and providing the proper system voltage before continuing with this Diagnostic procedure.

1. Refer to the recorded DTCS.

Are there any aftertreatment or NOx Sensor DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (F204) FUSED IGNITION CIRCUIT AND THE NOX SENSOR 1/1 GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition circuit and the NOx Sensor 1/1 Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the (F204) Fused Ignition circuit or the NOx Sensor 1/1 Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE NOX SENSOR 1/1 FOR PROPER OPERATION

NOTE: The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Replace the NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [7](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P06EB-00-NOX SENSOR 1/2 PROCESSOR PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM determines that the time to receive a NOx sensor valid message is greater than a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/2
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

NOTE: Ensure that the correct application NOx Sensors are being used (and properly connected in their correct locations) before continuing with this Diagnostic tree.

NOTE: Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage before continuing with this Diagnostic procedure.

1. Refer to the recorded DTCs.

Are there any aftertreatment or NOx Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE (F204) FUSED IGNITION CIRCUIT AND THE NOx SENSOR 1/2 GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition circuit and the NOx Sensor 1/1 Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the (F204) Fused Ignition circuit or the NOx Sensor 1/2 Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **6**

6. CHECK THE NOx SENSOR 1/2 FOR PROPER OPERATION

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Replace the NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To **7**

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P06FE-00-COLD START DIESEL INTAKE AIR FLOW CONTROL PERFORMANCE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the Throttle Valve Actuator circuit (upper limit of) maximum or (lower limit of) minimum deviates from a calibrated threshold for 3.0 seconds. This is a one Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any EGR, Intake Air Flow Open, Low, or High DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Replace the Throttle Valve Actuator in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
5. Start the engine and let it run for two minutes.
6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P07FF-00-COLD START TRANSMISSION PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- initial start-up Engine Coolant Temperature (ECT) Sensor value is greater than -7°C (19.4°F).
- Ambient Air Temperature (AAT) Sensor values is less than 6°C (42.8°F).
- AAT and ECT values are within 15°C (59°F) of each other.
- engine is running and vehicle speed is greater than 35 kph (22 mph).
- total engine run time is less than 15 minutes.

SET CONDITION

- The Powertrain Control Module (PCM) receives a CAN bus message from the Transmission Control Module (TCM) stating that the planned shift point cannot be met.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
TRANSMISSION RELATED FAULTS

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM/TCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [2](#)

2. CHECK FOR TRANSMISSION DTCS

1. Refer to the recorded DTCs.

Are there any TCM DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P0A1A-00-GENERATOR CONTROL MODULE

WHEN MONITORED

- This diagnostic runs continuously with the engine running.

SET CONDITION

- The Smart Alternator is reporting an internal over temperature fault to the Powertrain Control Module over the LIN BUS.

DEFAULT ACTION

- Battery light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ALTERNATOR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. Start the engine and allow it to idle.
2. With the scan tool, read DTCs.

Is this DTC active or pending?

Yes

- Replace the Alternator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT DTC diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P1139-00-DRIVE SWITCH 2 CIRCUIT HIGH

For a complete FUEL DELIVERY SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Water in Fuel (WIF) signal value is lower than a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
WIF FILTER FULL OF WATER
WIF SENSOR 1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
WIF SENSOR 1 SIGNAL CIRCUIT SHORT TO GROUND
WATER IN FUEL (WIF) HEATER/SENSOR ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. DRAIN THE WATER IN FUEL FILTER

1. Drain the WIF Filter using the drain valve on the bottom of the filter.

NOTE: If the DTC does not clear with the Scan Tool the vehicle will have to be driven approximately 10 minutes.

Is the DTC still active after draining the Filter?

Yes

- Go To [3](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE WATER IN FUEL (G123) SIGNAL 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. ISOLATE AND CHECK THE WATER IN FUEL (G123) SIGNAL 1 CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. REPLACE THE WATER IN FUEL SENSOR/HEATER ASSEMBLY AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [6](#)

No

- Replacing the faulty WIF Sensor/Heater assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P1220-00-EXCESSIVE CYCLING OF REDUCTANT LINE AIR PURGING CONTROL

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) pressure buildup system to provide correct (overall) performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup is reinitialized.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- The DEF Purge pressure buildup is active.

SET CONDITION

- If the PCM detects that the DEF pressure is equal to the pressure at the start of Purge pressure buildup after the DEF Supply Pump completes 35 strokes. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PUMP
DEF PURGE PUMP CONTROL CIRCUIT SHORT TO VOLTAGE
DEF PURGE PUMP CONTROL CIRCUIT SHORT TO GROUND
DEF PURGE PUMP CONTROL CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any DEF Supply Pump DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE DEF SUPPLY SYSTEM FOR LEAKS

1. Using the scan tool, begin the DEF Injector Quantity Test
2. During the DEF Injector Quantity Test, visually inspect the DEF Supply Pump Assembly and DEF Pressure Line for signs of a fluid leak.

Are there any leaks in the DEF System?

Yes

- Perform the appropriate repair. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE DEF PURGE PUMP (K481) CONTROL CIRCUIT FOR SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Pump_Temp/Level Sensor C1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Purge Pump (K481) Control circuit at the DEF Pump_Temp/Level Sensor C1 harness connector.

Is there voltage above 5.2 volts present?

Yes

- Repair the DEF Purge Pump (K481) Control circuit for a short to voltage. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK THE DEF PURGE (K481) CONTROL CIRCUIT FOR SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance between ground and the DEF Purge Pump (K481) Control circuit at the DEF Pump_Temp/Level Sensor C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [6](#)

No

- Repair the DEF Purge Pump (K481) Control circuit for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

6. CHECK THE SCR RELAY 1 (K401) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the DEF Purge (K481) Control circuit between the DEF Pump_Temp/Level Sensor C1 harness connector and the PCM C2. harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Purge (K481) Control circuit for an open/high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [7](#)

7. CHECK THE DEF PUMP FOR PROPER OPERATION

1. Replace the DEF Pump in accordance with the Service Information.
2. Reconnect the PCM C2 harness connector.
3. Reconnect the DEF Pump Temp/Level Sensor C1 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase PCM DTCs.
6. Start the engine and run it until it reaches operating temperature.
7. Test drive the vehicle under normal operating conditions.
8. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [8](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P1221-00-EXCESSIVE CYCLING OF REDUCTANT PUMP INLET DEFROSTING

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors Diesel Exhaust Fluid (DEF) pressure and DEF Supply Pump lifts to determine frost build-up in the DEF Inlet and DEF Outlet lines. If the DEF Supply Pump lifts are too frequent and one of the DEF line pressure inputs is outside a calibrated threshold, the PCM will turn on the Malfunction Illumination Lamp (MIL) and set the DTC.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated

SET CONDITION

- The PCM detects that there is frost buildup in the DEF Inlet (Tank) line.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
DEF INLET (TANK) LINE
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump or DEF Heater DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF INLET (TANK) LINE FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF Inlet (Tank) Line for leaks.

Are there any leaks present?

Yes

- Repair the DEF Inlet (Tank) Line that is leaking.
- Go To

Refer to [4](#).

No

- Go To [5](#)

4. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Repairing the line corrected the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE DEF INLET (TANK) LINE FOR PROPER OPERATION

1. Replace the DEF Inlet (Tank) Line in accordance with the Service Information.
2. Ignition on, engine not running.
3. With the scan tool, erase DTCs in the PCM.
4. It may be necessary to cold-soak the vehicle outdoors for an extended period to re-produce the failure cycle for this DTC.
5. Start the engine.
6. Allow the engine to reach normal operating temperature.
7. Monitor the scan tool for at least two minutes.
8. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [6](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P1222-00-EXCESSIVE CYCLING OF REDUCTANT PUMP OUTLET DEFROSTING

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors Diesel Exhaust Fluid (DEF) pressure and DEF Supply Pump lifts to determine frost build-up in the DEF Inlet and DEF Outlet lines. If the DEF Supply Pump lifts are too frequent and one of the DEF line pressure inputs is outside a calibrated threshold, the PCM will turn on the Malfunction Illumination Lamp (MIL) and set the DTC.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that there is frost buildup in the DEF Outlet (Supply) line.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
DEF OUTLET (SUPPLY) LINE
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump or DEF Heater DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DEF OUTLET (SUPPLY) LINE FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF Outlet (Supply) Line for leaks.

Are there any leaks present?

Yes

- Repair the DEF Outlet (Supply) Line that is leaking.
- Go To [4](#)

No

- Go To [5](#)

4. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Repairing the line corrected the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE DEF OUTLET (SUPPLY) LINE FOR PROPER OPERATION

1. Replace the DEF Outlet (Supply) Line in accordance with the Service Information.
2. Ignition on, engine not running.
3. With the scan tool, erase DTCs in the PCM.
4. It may be necessary to cold-soak the vehicle outdoors for an extended period to re-produce the failure cycle for this DTC.
5. Start the engine.
6. Allow the engine to reach normal operating temperature.
7. Monitor the scan tool for at least two minutes.
8. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [6](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P1286-00 To P2080-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P1286-00-NOX SENSOR 1/1 ZERO OFFSET TOO HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the engine exhaust temperature at NOx Sensor 1/1 is above 150B°C (302B°F), and the engine is in a decel condition and zero fueling.
- When the engine exhaust temperature at NOx Sensor 1/1 is above 150B°C (302B°F), and the calculated NOx value is changing.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/1 reading is not reading zero during decel condition and zero fueling for two consecutive trips or the PCM has detected that the NOx Sensor 1/1 reading is not changing with engine conditions for two consecutive trips.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/1 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. With the scan tool, read DTCS.

NOTE: If there are any NOx Sensor circuit-related DTCS present, perform the diagnostic for those DTCS before continuing with this one.

NOTE: If there are any Injector, EGR, or Turbocharger DTCS present, perform the diagnostic for those DTCS before continuing with this one.

NOTE: If there are any DEF DTCS present, perform the diagnostic for those DTCS before continuing with this one.

5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ENGINE FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate diagnostic information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE AFTER TREATMENT SYSTEM FOR EXCESSIVE ENGINE OIL

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the after treatment system from the engine.

Was engine oil, fuel or moisture found in the turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [4](#)

4. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Reconnect the DEF Injector harness connector.
2. Place the DEF Injector in a container to capture the fluid sprayed.
3. Turn the ignition on.
4. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/1 in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P1287-00-NOX SENSOR 1/1 ZERO OFFSET TOO LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the engine exhaust temperature at NOx Sensor 1/1 is above 150B°C (302B°F), and the engine is in a decel condition and zero fueling.
- When the engine exhaust temperature at NOx Sensor 1/2 is above 150B°C (302B°F), and the calculated NOx value is changing.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/ reading is not reading zero during decel condition and zero fueling for two consecutive trips or the PCM has detected that the NOx Sensor 1/1 reading is not changing with engine conditions for two consecutive trips.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS

Possible Causes

NO_x SENSOR 1/1 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. With the scan tool, read DTCS.

NOTE: If there are any NO_x Sensor circuit-related DTCS present, perform the diagnostic for those DTCS before continuing with this one.

NOTE: If there are any Injector, EGR, or Turbocharger DTCS present, perform the diagnostic for those DTCS before continuing with this one.

NOTE: If there are any DEF DTCS present, perform the diagnostic for those DTCS before continuing with this one.

5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ENGINE FOR A CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate diagnostic information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE AFTER TREATMENT SYSTEM FOR EXCESSIVE ENGINE OIL

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the after treatment system from the engine.

Was engine oil, fuel or moisture found in the turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Reconnect the DEF Injector harness connector.
2. Place the DEF Injector in a container to capture the fluid sprayed.
3. Turn the ignition on.
4. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P1288-00-NOX SENSOR 1/2 ZERO OFFSET TOO HIGH

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the engine exhaust temperature at NOx Sensor 1/2 is above 150B°C (302B°F), and the engine is in a decel condition and zero fueling.
- When the engine exhaust temperature at NOx Sensor 1/2 is above 150B°C (302B°F), and the calculated NOx value is changing.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/2 reading is not reading zero during decel condition and zero fueling for two consecutive trips or the PCM has detected that the NOx Sensor 1/2 reading is not changing with engine conditions for two consecutive trips.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NO _x SENSOR 1/2 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. With the scan tool, read DTCs.

NOTE: If there are any NO_x Sensor circuit-related DTCs present, perform the diagnostic for those DTCs before continuing with this one.

NOTE: If there are any Injector, EGR, or Turbocharger DTCs present, perform the diagnostic for those DTCs before continuing with this one.

NOTE: If there are any DEF DTCs present, perform the diagnostic for those DTCs before continuing with this one.

5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any NO_x Sensor circuit-related, EGR, Turbocharger, or DEF DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**3**](#)

3. CHECK THE ENGINE FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate diagnostic information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**4**](#)

4. CHECK THE AFTER TREATMENT SYSTEM FOR EXCESSIVE ENGINE OIL

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the after treatment system from the engine.

Was engine oil, fuel or moisture found in the turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**6**](#)

6. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Reconnect the DEF Injector harness connector.
2. Place the DEF Injector in a container to capture the fluid sprayed.
3. Turn the ignition on.
4. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P1289-00-NOX SENSOR 1/2 ZERO OFFSET TOO LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- When the engine exhaust temperature at NOx Sensor 1/2 is above 150B°C (302B°F), and the engine is in a decel condition and zero fueling.
- When the engine exhaust temperature at NOx Sensor 1/2 is above 150B°C (302B°F), and the calculated NOx value is changing.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/2 reading is not reading zero during decel condition and zero fueling for two consecutive trips or the PCM has detected that the NOx Sensor 1/2 reading is not changing with engine conditions for two consecutive trips.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/2 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. With the scan tool, read DTCs.

NOTE: If there are any NOx Sensor circuit-related DTCs present, perform the diagnostic for those DTCs before continuing with this one.

NOTE: If there are any Injector, EGR, or Turbocharger DTCs present, perform the diagnostic for those DTCs before continuing with this one.

NOTE: If there are any DEF DTCs present, perform the diagnostic for those DTCs before continuing with this one.

5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF, EGR, Turbocharger or NOx Sensor circuit-related DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE ENGINE FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate diagnostic information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE AFTER TREATMENT SYSTEM FOR EXCESSIVE ENGINE OIL

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the after treatment system from the engine.

Was engine oil, fuel or moisture found in the turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.

2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Reconnect the DEF Injector harness connector.
2. Place the DEF Injector in a container to capture the fluid sprayed.
3. Turn the ignition on.
4. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P1290-00-COLD START FUEL PRESSURE TOO HIGH BANK 1

WARNING: High Pressure fuel lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 23, 200 PSI (1600BAR). Use extreme caution when inspecting for high pressure fuel leaks. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Fuel under this amount of pressure can penetrate skin causing possible serious or fatal injury. Inspect for high pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when

servicing fuel system. Failure to follow these instructions may result in possible serious or fatal injury.

THEORY OF OPERATION

The Fuel Injection Pump (sometimes called the 'High Pressure Delivery Pump') is mounted on the Engine. It creates high-pressure fuel for the Fuel Rail, which supplies the Fuel Injectors. Fuel enters the Fuel Injection Pump from the electric Lift Pump, which is located inside the Fuel Tank. The Fuel Injection Pump has a built-in cascade overflow valve at the inlet that re-directs excess fuel accumulated during low-pressure delivery. Excess fuel is used to lubricate the Fuel Injection Pump and then returned to the Fuel Tank. The low-pressure fuel delivery continues on to the Fuel Quantity Solenoid (FQS).

The Powertrain Control Module (PCM) uses the FQS to meter the amount of low-pressure fuel entering the high-pressure pumping chambers inside the Fuel Injection Pump. The FQS works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is mounted in the Fuel Injection Pump. The PCM supplies the solenoid with a 12 Volt supply and a Pulse Width Modulated (PWM) control circuit synchronized to the Camshaft position.

The FPR is positioned at the return passage of the Fuel Rail. The FPR default position is open when not being controlled by the PCM. When the FPR is open, it allows fuel pressure in the rail to escape into the return circuit and onward back to the Fuel Tank. When the PCM wants to increase Fuel Rail pressure, it commands the FPR to close, allowing fuel pressure to build up.

The PCM monitors fuel pressure at the Fuel Rail. The Fuel RAIL Pressure Sensor (FRPS) is a three wire 5-Volt sensor mounted on the Fuel Rail. The FRPS monitors the high-pressure fuel injection system. The PCM uses this value to calculate and adjust the amount fuel pressure in the Fuel Rail. The PCM is then able to maintain constant fuel pressure for proper Fuel Injector operation.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P0088-00 monitor when there is a Fuel Rail pressure-high occurrence during the SHU mode.

The PCM uses the P1290-00 monitor when there is a Fuel Rail pressure-high occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Driving under normal operating conditions.
- Engine operating temperature below 82B°C (180B°F).

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too high for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any PCM DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE FUEL SYSTEM FOR A LEAK

1. Turn the ignition off.
2. Inspect the entire fuel system for leakage.

Is there any evidence of leakage?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **4**

4. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Inspect the fuel system for contamination.

Is the fuel contaminated?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **5**

5. CHECK THE ENGINE FOR PROPER STARTING CONDITIONS

1. With the scan tool, erase the PCM DTCs.
2. Attempt to start the engine.

Does the engine start and idle?

Yes

- Go To **6**

No

- Go To **10**

6. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER PRESSURE

1. With the scan tool, compare the Fuel Pressure Set point with the Actual Fuel Pressure.

NOTE: **A sticking Fuel Pressure Regulator is indicated by the Actual Fuel Pressure gradually dropping below the Fuel Pressure Setpoint then suddenly increasing (spiking) above the Fuel Pressure Setpoint.**

Does the Actual Fuel Pressure gradually decrease then suddenly increase (spike) above the Fuel Pressure Setpoint?

Yes

- Replace the Fuel Pressure Regulator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To **7**

7. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM**.

Were there any problems with the Fuel Delivery System?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [8](#)

8. CHECK THE FUEL INJECTOR(S) FOR PROPER OPERATION

NOTE: An injector that sticks open can cause this DTC. A sticking injector will cause the engine to misfire and emit excessive black smoke from the exhaust system.

Does the engine exhibit the symptoms described in the above note?

Yes

- Using the Service Information, remove and inspect the Fuel Injectors for signs of damage or debris that may cause the injector to stick. Sticking injectors may cause the combustion chamber to become black and oil soaked. Replace Injector(s) as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [9](#)

9. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Fuel Pressure Regulator in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase the PCM DTCs.
5. Attempt to start and test drive the vehicle.
6. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Replace the High Pressure Delivery Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Replacing the Fuel Pressure Regulator corrected the Fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

10. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM**.

Were there any problems with the Fuel Delivery System?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [11](#)

11. CHECK THE FUEL QUANTITY SOLENOID FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Fuel Quantity Solenoid in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase the PCM DTCs.
5. Attempt to start and test drive the vehicle.
6. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Replacing the Fuel Quantity Solenoid corrected the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

12. CHECK THE FUEL PRESSURE REGULATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Fuel Pressure Regulator in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase the PCM DTCs.
5. Attempt to start and test drive the vehicle.
6. With the scan tool, read the PCM DTCs.

Did the DTC return?

Yes

- Replace the High Pressure Delivery Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P1292-00-COLD START FUEL PRESSURE TOO LOW BANK 1

WARNING: High Pressure fuel lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 23, 200 PSI (1600BAR). Use extreme caution when inspecting for high pressure fuel leaks. Failure to follow these instructions may result in possible serious or fatal injury.

WARNING: Fuel under this amount of pressure can penetrate skin causing possible serious or fatal injury. Inspect for high pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system. Failure to follow these instructions may result in possible serious or fatal injury.

THEORY OF OPERATION

The **Fuel Injection Pump** (sometimes called the '**High Pressure Delivery Pump (HPDP)** ') is mounted on the Engine and gear driven. It creates high-pressure fuel for the Fuel Rail, which supplies the Fuel Injectors. Fuel enters the Fuel Injection Pump from the electric Lift Pump, which is located inside the Fuel Tank. The Fuel Injection Pump has a built-in cascade overflow valve at the inlet that re-directs excess fuel accumulated during low-pressure delivery. Excess fuel is used to lubricate the Fuel Injection Pump and then returned to the Fuel Tank. The low-pressure fuel delivery continues on to the **Fuel Quantity Solenoid (FQS)** .

The **Powertrain Control Module (PCM)** uses the FQS to meter the amount of low-pressure fuel entering the high-pressure pumping chambers inside the Fuel Injection Pump. The FQS works in tandem with the Fuel Pressure Regulator (FPR) to control fuel volume and pressure in the Fuel Rail. The FQS is mounted in the HPDP. The PCM supplies the solenoid with a 12 Volt supply and a Pulse Width Modulated (PWM) low side control circuit to control fuel quantity entering the Lift Pump.

The FPR is positioned at the return passage of the Fuel Rail. The FPR default position is open when not being controlled by the PCM. When the FPR is open, it allows fuel pressure in the rail to escape into the return circuit and onward back to the Fuel Tank. When the PCM wants to increase Fuel Rail pressure, it commands the FPR to close, allowing fuel rail pressure to increase and opens to increase fuel returned to the tank and decrease fuel rail pressure.

The PCM monitors fuel pressure at the Fuel Rail. The **Fuel RAIL Pressure Sensor (FRPS)** is a three wire 5-Volt sensor mounted on the Fuel Rail. The FRPS monitors the high-pressure fuel injection system. The PCM uses this value to calculate and adjust the amount fuel pressure in the Fuel Rail. The PCM is then able to maintain constant fuel pressure for proper Fuel Injector operation under varying load conditions.

There are two separate approaches used for this monitor: The **Standard Heat-Up (SHU)** and the **Rapid Heat-Up (RHU)** . Fuel economy and emissions are improved when the engine is allowed to reach a higher operating temperature and engine performance and torque are improved when the engine is operating at a cooler temperatures. The PCM determines which heat-up mode to use based on various environmental and operating conditions.

The PCM uses the P0087-00 monitor when there is a Fuel Rail pressure-low occurrence during the SHU mode.

The PCM uses the P1292-00 monitor when there is a Fuel Rail pressure-low occurrence during the RHU mode.

The PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition. Because the PCM switches between SHU and RHU modes, both DTCs may be present due to the same fail condition.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- The vehicle is being driven under normal operating conditions.

- Engine operating temperature below 82B°C (180B°F).

SET CONDITION

- The Powertrain Control Module (PCM) determines that the fuel rail pressure is too low for a given engine speed and load.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
GELLED FUEL
CHASSIS MOUNTED FUEL HEATER-FUEL FILTER
NO VOLTAGE AT CHASSIS MOUNTED FUEL HEATER
AIR IN FUEL SYSTEM
FUEL DELIVERY SYSTEM
FUEL PRESSURE SENSOR
FUEL INJECTOR(S)
FUEL PRESSURE REGULATOR
HIGH PRESSURE DELIVERY PUMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE PCM FOR CHECK FOR OTHER DTCS

1. Turn the ignition on.

2. With the scan tool, read the PCM DTCs.

Are there any other DTCs present?

Yes

- Repair the other DTCs before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE FUEL SYSTEM FOR A LEAK

1. Turn the ignition off.
2. Visually inspect the entire fuel system for signs of a leak.

Is there any evidence of leakage?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE FUEL SYSTEM FOR CONTAMINATION

1. Check the Fuel System for contamination. Refer to - Fuel System -Fuel Delivery -Standard Procedure - DIESEL FUEL SYSTEM CONTAMINATION.

Is there any evidence of contamination?

Yes

- Repair as necessary in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE VEHICLE FOR PROPER OPERATING CONDITIONS

1. Determine the environmental conditions at or near the time the DTC set.

Has the vehicle been operated or cold soaked in ambient temperatures below freezing?

Yes

- Go To [6](#)

No

- Go To [8](#)

6. CHECK THE FUEL SYSTEM FOR GELLED FUEL BY PERFORMING THE IN-TANK LIFT PUMP FLOW TEST

NOTE: Before performing the IN-TANK FUEL LIFT PUMP FLOW test, verify that the fuel level in the fuel tank is above 1/4 full. If fuel tank is not above 1/4 full the pump will take in air causing the test results to be inaccurate.

1. Disconnect the low pressure fuel supply line from the High Pressure Fuel Pump. Connect the (special tool #8978A, Decay Tool, Fuel) to the low pressure fuel supply line.

WARNING: To reduce the risk of fire and serious possible serious or fatal injury, place the Reservoir Assembly 534960 (3) on the floor and out of the way so that it is not a trip hazard.

2. Perform the following to purge air from the system:
 - With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve and allow the fuel to flow into the Reservoir for 15 seconds, then close the Flow Test Valve.
 - Turn the ignition off.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
3. Perform the following three times to find the average flow rate:
 - With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the Valve.
 - Turn the ignition off.
 - Measure and record the amount of fuel in the Reservoir Assembly.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
4. Add the three recorded measurements and then divide the total by three to calculate the average flow rate.

NOTE: The flow rate specification is 750 ml in 15 seconds.

Does the average flow rate meet or exceed the specification?

Yes

- If the vehicle exhibited symptoms related to fuel gelling such as hard start, start and stall, and/or low power, but no longer exhibits these symptoms, fuel gelling may have been present but corrected itself. The fuel temperature may have increased through normal operation or if the vehicle was parked inside a warm building. Verify the fuel heater is receiving power with the ignition on, and also check for proper operation of the fuel heater.
- Add a bottle of MOPAR Premium Fuel Treatment to the Fuel Tank.
- Then, Go To [8](#)

No

- Leave the Fuel Decay Tester installed. Remove the fuel filter and inspect for fuel gelling/wax build-up and other contaminants. If wax build-up is found, the fuel has gelled. Replace the fuel filter and correct the fuel gelling accordingly before any further testing. Verify the fuel heater is receiving power with the ignition on, and also check for proper operation of the fuel heater.
- If no wax build-up or signs of fuel gelling is found, replace the Fuel Filter/Water Separator in accordance with the Service Information.
- Then, Go To [1](#)

7. RECHECK THE FUEL SYSTEM FOR PROPER IN-TANK FUEL LIFT PUMP FLOW

1. Perform the following to purge air from the system:
 - With the scan tool, actuate the In-Tank Fuel Lift Pump Module.

- Open the Flow Test Valve for 15 seconds, then close the Valve.
 - Turn the ignition off.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
2. Perform the following three times to find the average flow rate:
- With the scan tool, actuate the In-Tank Fuel Lift Pump Module.
 - Open the Flow Test Valve for 15 seconds, then close the valve.
 - Turn the ignition off.
 - Measure and record the amount of fuel in the Reservoir Assembly.
 - Disconnect, empty, and then reconnect the Reservoir Assembly.
3. Add the three recorded measurements and then divide the total by three to calculate the average flow rate.

NOTE: **The flow rate specification is 750 ml in 15 seconds.**

Does the average flow rate meet or exceed the specification?

Yes

- Repair complete. But, add a bottle of MOPAR Premium Fuel Treatment to the Fuel Tank.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Use the appropriate wiring diagram as a guide to check the In-Tank Fuel Lift Pump wiring for an open, high resistance, or short to ground. If the In-Tank Fuel Lift Pump wiring is okay, remove the fuel tank and replace the In-Tank Fuel Lift Pump Module in accordance with the Service Information. Also, add a bottle of MOPAR Premium Fuel Treatment to the Fuel Tank.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

8. CHECK THE FUEL DELIVERY SYSTEM FOR PROPER OPERATION

1. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** and perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure.

Were any problems found?

Yes

- Repair as necessary.

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

P1296-00-EGR SLOW RESPONSE - INCREASING FLOW WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The ECM detects EGR flow is more than the requested flow.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
AIR RESTRICTION
CHECKING FOR AIR LEAKS
CHECKING THE EGR COOLER AND TUBES
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Mass Air Flow DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE AIR FILTER FOR AIR FLOW RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR AIR RESTRICTIONS

NOTE: Inspect all air intake, crankcase vent and turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

1. Inspect the intake system, exhaust system and related tubes and connections.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE INTAKE SYSTEM FOR AIR LEAKS

1. Remove the Inlet Pressure Sensor.
2. Connect smoke machine to the Inlet Pressure Sensor port in the intake duct and begin injecting smoke into the intake system.
3. Observe all intake system components for evidence of smoke leakage.

Is there evidence of smoke leakage?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE EGR COOLER AND TUBES FOR AIR FLOW RESTRICTION

1. Turn the ignition off.

2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive carbon build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the EGR Valve.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P1297-00-EGR SLOW RESPONSE - DECREASING FLOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The ECM detects EGR flow is less than the requested flow.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
AIR FILTER
AIR RESTRICTION
CHECKING FOR AIR LEAKS
CHECKING THE EGR COOLER AND TUBES
EGR VALVE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Mass Air Flow DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE AIR FILTER FOR AIR FLOW RESTRICTION

1. Turn the ignition off.
2. Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter element.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE AIR INTAKE AND EXHAUST SYSTEMS FOR AIR RESTRICTIONS

NOTE: Inspect all air intake, crankcase vent and turbocharger related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

NOTE: Inspect the exhaust system and related tubes for damage, restriction or poor connection. Any of these conditions can cause this DTC to set.

1. Inspect the intake system, exhaust system and related tubes and connections.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE INTAKE SYSTEM FOR AIR LEAKS

1. Remove the Inlet Pressure Sensor.
2. Connect smoke machine to the Inlet Pressure Sensor port in the intake duct and begin injecting smoke into the intake system.
3. Observe all intake system components for evidence of smoke leakage.

Is there evidence of smoke leakage?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE EGR COOLER AND TUBES FOR AIR FLOW RESTRICTION

1. Turn the ignition off.
2. Gain access to and inspect the EGR Cooler and both tubes that connect to the EGR Cooler. Check tubes and cooler for damage, leaks, excessive carbon build up and other problems that could restrict or prevent proper exhaust gas flow.

NOTE: Compressed air (at low pressure) can be applied to the lower port of the EGR Cooler. When applying compressed air check for air to flow through cooler and out the upper port. Always wear safety glasses when working with compressed air.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the EGR Valve.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P1500-00-ECU CONFIGURATION MISMATCH

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- This DTC is set in the Powertrain Control Module (PCM) when an implausible message is received from the Body Control Module (BCM).

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
FAULTY ELECTRICAL CONNECTIONS BETWEEN THE PCM AND BCM
BODY CONTROL MODULE (BCM) NOT PROPERLY PROGRAMED OR WAS REPLACED AND NOT PROGRAMED
POWERTRAIN CONTROL MODULE (PCM) NOT PROPERLY PROGRAMED OR WAS REPLACED AND NOT PROGRAMED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding.
Refer to **INTERMITTENT DTC** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Go To [4](#)

2. CHECK THE BCM

Has the BCM been reprogrammed or replaced without being programmed?

Yes

- Program the BCM if not programmed. With the scan tool perform the proxi update procedure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE PCM

Has the PCM been recently replaced with a new or used controller?

Yes

- With the scan tool perform a PCM proxi relearn.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- With the scan tool perform a PCM proxi relearn and recheck for DTC. If DTC reset and using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. Check for any Service Bulletins for possible causes that may apply. If no problems are found, replace the Powertrain Control Module in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE WIRING AND CONNECTORS

1. The conditions necessary to set this DTC are not present at this time.
2. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
3. Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Test Complete.

P152E-00-ENGINE HOOD SWITCH 2 CIRCUIT HIGH

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The hood ajar status is monitored using two switches for the Engine Stop/Start (ESS) equipped vehicles. Hood Ajar Switch one is integrated into the Hood Latch and is hard wired to the Body Control Module (BCM). The signal is sent to the Powertrain Control Module (PCM) over the CAN BUS. Hood Ajar Switch 2 is hard wired to the PCM. If the PCM detects that either switch is in the open position or is faulted for any reason, the ESS feature will be disabled during the current ignition cycle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition.
- With the Electric Stop/Start (ESS) is enabled.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Engine Hood Switch 2 voltage is above 4.9 volts for 0.32 seconds.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
ENGINE HOOD SWITCH 2 SIGNAL CIRCUIT SHORT TO VOLTAGE
ENGINE HOOD SWITCH 2 SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
ENGINE HOOD SWITCH 2
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE ENGINE HOOD SWITCH 2 (K806) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Engine Hood Switch 2 harness connector.
3. Turn the ignition off.
4. Measure the voltage on the Engine Hood Switch 2 (K806) Signal circuit at the Engine Hood Switch 2 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Engine Hood Switch 2 (K806) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE ENGINE HOOD SWITCH 2 (K806) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Engine Hood Switch 2 (K806) Signal circuit between the Engine Hood Switch 2 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Engine Hood Switch 2 (K806) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE (K915) SENSOR GROUND CIRCUIT FOR AN OPEN

1. Measure the resistance of the (K915) Sensor Ground circuit between the Engine Hood Switch 2 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K915) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE ENGINE HOOD SWITCH 2 FOR PROPER OPERATION

1. Remove the Engine Hood Switch 2.
2. Depress and release the switch while measuring the resistance across the terminals of the Engine Hood Switch 2.

NOTE: The switch should have continuity when not depressed and be open when it is depressed.

Did the resistance read as described above?

Yes

- Go To [6](#)

No

- Replace Engine Hood Switch 2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P152F-00-ENGINE HOOD SWITCH 2 / ENGINE HOOD SWITCH 1 CORRELATION

For a complete VEHICLE THEFT SECURITY SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The hood ajar status is monitored using two switches for the Engine Stop/Start (ESS) equipped vehicles. Hood Ajar Switch one is integrated into the Hood Latch and is hard wired to the Body Control Module (BCM). The signal is sent to the Powertrain Control Module (PCM) over the CAN BUS. Hood Ajar Switch 2 is hard wired to the PCM. If the PCM detects that either switch is in the open position or is faulted for any reason, the ESS feature will be disabled during the current ignition cycle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition.
- When the Electric Stop-Start (ESS) has not been disabled due to a hood switch fault.

SET CONDITION

- The PCM detects that the Engine Hood Switch 1 state and Engine Hood Switch 2 state do not match. The Malfunction Indicator Lamp (MIL) will illuminate and the ESS will be disabled when this DTC is active.

DEFAULT ACTION

- This is a non-MIL fault.
- If the vehicle is equipped with the stop/start feature, the system will be disabled when this DTC is active.

POSSIBLE CAUSES

Possible Causes
HOOD NOT SECURED PROPERLY ENGINE HOOD SWITCH 2 SIGNAL CIRCUIT SHORT TO GROUND HOOD AJAR SWITCH SENSE CIRCUIT SHORT TO GROUND DEFECTIVE OR STICKING ENGINE HOOD SWITCH 1 DEFECTIVE OR STICKING ENGINE HOOD SWITCH 2 BODY CONTROL MODULE (BCM) POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other Engine Hood Switch DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [3](#)

3. CHECK THE HOOD, HOOD AJAR SWITCH AND LATCH ASSEMBLY FOR PROPER INSTALLATION

1. Visually inspect that the Hood is secured properly. Also inspect the Hood Ajar Switch and Latch assembly for proper installation.

Were any problems found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE ENGINE HOOD SWITCH 2 FOR PROPER VOLTAGE

1. Turn the ignition off.
2. Disconnect the Engine Hood Switch 2 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the (K806) Engine Hood Switch 2 Signal circuit at the Engine Hood Switch 2 harness connector.

Is the voltage reading above 4.9 volts?

Yes

- Go To [7](#)

No

- Go To [5](#)

5. CHECK THE ENGINE HOOD SWITCH 2 (K806) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Check for continuity between ground and the Engine Hood Switch 2 (K806) Signal circuit at the Engine Hood Switch 2 harness connector.

Is there continuity between ground and the Engine Hood Switch 2 (K806) Signal circuit?

Yes

- Repair the Engine Hood Switch 2 (K806) Signal circuit for a short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE ENGINE HOOD SWITCH 2

1. Turn the ignition off.
2. Remove the Engine Hood Switch 2.

3. Depress and release the switch while measuring the resistance across the terminals of the Engine Hood Switch 2.

NOTE: **The switch should have continuity when not depressed and be open when it is depressed.**

Did the resistance read as described above?

Yes

- Go To [8](#)

No

- Replace Engine Hood Switch 2.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

8. CHECK THE HOOD AJAR SWITCH VOLTAGE

1. Disconnect the Hood Ajar Switch (Hood Latch) harness connector.
2. Turn the ignition on.
3. Measure the voltage on the Hood Ajar Switch (G70) Sense circuit at the Hood Ajar Switch harness connector.

Is the voltage above 4.9 volts?

Yes

- Replace the Hood Ajar Switch (Hood Latch).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [9](#)

9. CHECK THE HOOD AJAR SWITCH (G70) SENSE CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the BCM A harness connector.
3. Check for continuity between ground and the Hood Ajar Switch (G70) Sense circuit at the Hood Ajar Switch harness connector.

Is there continuity between ground and the Hood Ajar Switch (G70) Sense circuit?

Yes

- Repair the Hood Ajar Switch (G70) Sense circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [10](#)

10. BODY CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Hood Ajar Switch and the Body Control Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.

3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the Body Control Module in accordance with the Service Information.
- Perform the BCM VERIFICATION TEST. Refer to [**BODY VERIFICATION TEST**](#).

P1660-00-EMERGENCY STOP FUEL SHUT-OFF SOLENOID

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Occupant Restraint Controller (ORC) sends a CAN Bus message to the Powertrain Control Module (PCM) indicating that the airbags have been deployed.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CRASH DETECTED

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#).

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- This DTC is set to inform the technician that the vehicle has been in an accident and that the airbag module has deployed the airbags. No further diagnostics are required.

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P1686-00-EGR ACTUATOR CONTROL CIRCUIT LOW - POSITIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the EGR Solenoid command off.

SET CONDITION

- The PCM detects that the EGR Solenoid Control (+) circuit is below a calibrated threshold for 1.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR CONTROL (+) CIRCUIT SHORT TO GROUND
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE EGR CONTROL (+) (K682) CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the EGR Valve harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance from ground to the EGR Control (+) (K682) circuit at the EGR Valve harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the EGR Control (+) (K682) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE EGR VALVE FOR PROPER OPERATION

1. Replace the EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine and test drive the vehicle until the engine reaches operating temperature.
5. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P1688-00-EGR ACTUATOR CONTROL CIRCUIT HIGH - POSITIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the EGR Solenoid command off.

SET CONDITION

- The PCM detects that the EGR Solenoid Control (+) circuit is above a calibrated threshold for 1.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR CONTROL (+) CIRCUIT SHORT TO VOLTAGE
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EGR CONTROL (+) (K682) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Valve harness connector.
3. Measure the voltage on the EGR Control (+) (K682) circuit at the EGR Valve harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the EGR Control (+) (K682) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EGR VALVE FOR PROPER OPERATION

1. Replace the EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine and test drive the vehicle until the engine reaches operating temperature.
5. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P1689-00-EGR ACTUATOR CONTROL CIRCUIT LOW - NEGATIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- With the EGR Solenoid command off.

SET CONDITION

- The PCM detects that the EGR Solenoid Control (-) circuit is below a calibrated threshold for 1.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR CONTROL (-) CIRCUIT SHORT TO GROUND
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE EGR (K684) CONTROL (-) CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the EGR Valve harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance from ground to the EGR (K684) Control (-) circuit at the EGR Valve harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the EGR (K684) Control (-) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE EGR VALVE FOR PROPER OPERATION

1. Replace the EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine and test drive the vehicle until the engine reaches operating temperature.
5. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P168A-00-EGR ACTUATOR CONTROL CIRCUIT HIGH - NEGATIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Exhaust Gas Recirculation (EGR) Valve is opened by a motor located inside the EGR Valve. The pulse width modulated motor is controlled by the Powertrain Control Module (PCM). The EGR Valve also has an internal three wire 5-Volt EGR Position Sensor. This internal sensor reports the position of the valve back to the PCM over the EGR Position Sensor Signal circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the EGR Solenoid command off.

SET CONDITION

- The PCM detects that the EGR Solenoid Control (-) circuit is above a calibrated threshold for 1.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGR CONTROL (-) CIRCUIT SHORT TO VOLTAGE
EGR VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE EGR CONTROL (-) (K684) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the EGR Valve harness connector.
3. Measure the voltage on the EGR Control (-) (K684) circuit at the EGR Valve harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the EGR Control (-) (K684) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE EGR VALVE FOR PROPER OPERATION

1. Replace the EGR Valve in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine and test drive the vehicle until the engine reaches operating temperature.
5. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P1690-00-REDUCTANT INJECTION VALVE CIRCUIT LOW - POSITIVE SIDE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the Diesel Exhaust Fluid (DEF) Injector Positive circuit voltage is below a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF INJECTOR SIGNAL CIRCUIT SHORTED TO GROUND
DEF INJECTOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE DEF INJECTOR SIGNAL (K428) CIRCUIT FOR A SHORT TO GROUND

1. Turn the Ignition off.
2. Disconnect the DEF Injector harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the DEF Injector Signal (K428) circuit at the DEF Injector harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Injector Signal (K428) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Reconnect the DEF Injector harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.

6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. Test drive the vehicle under all normal conditions.
9. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P1691-00-REDUCTANT INJECTION VALVE CIRCUIT HIGH - POSITIVE SIDE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

When Monitored:

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the Diesel Exhaust Fluid (DEF) Injector Positive circuit voltage is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF INJECTOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
DEF INJECTOR SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
DEF INJECTOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF INJECTOR (K428) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the Ignition off.

2. Disconnect the DEF Injector harness connector.

3. Turn the Ignition on.

4. Measure the voltage on the DEF Injector (K428) Signal circuit at the DEF Injector harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the DEF Injector (K428) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE DEF INJECTOR (K428) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.

2. Disconnect the PCM C2 harness connector.

3. Measure the resistance of the DEF Injector (K428) Signal circuit between the DEF Injector harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Injector (K428) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Reconnect the DEF Injector harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. Test drive the vehicle under all normal conditions.
9. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P1692-00-REDUCTANT INJECTION VALVE CIRCUIT LOW - NEGATIVE SIDE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the Diesel Exhaust Fluid (DEF) Injector Negative circuit voltage is below a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF INJECTOR RETURN CIRCUIT SHORTED TO GROUND
DEF INJECTOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
DEF INJECTOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE DEF INJECTOR (K428) RETURN CIRCUIT FOR A SHORT TO GROUND

1. Turn the Ignition off.
2. Disconnect the DEF Injector harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the DEF Injector (K426) Return circuit at the DEF Injector harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Injector (K426) Return circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE DEF INJECTOR (K428) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the DEF Injector (K428) Return circuit between the DEF Injector harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Injector(K428) Return circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Reconnect the DEF Injector harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. Test drive the vehicle under all normal conditions.
9. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P1693-00-REDUCTANT INJECTION VALVE CIRCUIT HIGH - NEGATIVE SIDE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold

start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the Diesel Exhaust Fluid (DEF) Injector Negative circuit voltage is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF INJECTOR NEGATIVE CIRCUIT SHORTED TO VOLTAGE
DEF INJECTOR
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Supply Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF INJECTOR (K428) RETURN CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the Ignition off.
2. Disconnect the DEF Injector harness connector.
3. Turn the Ignition on.
4. Measure the voltage on the DEF Injector (K426) Return circuit at the DEF Injector harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the DEF Injector (K426) Return circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Reconnect the DEF Injector harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. Test drive the vehicle under all normal conditions.
9. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.

9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P1732-00-THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW - POSITIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the Throttle Valve Motor Actuator (+) circuit voltage is below a calibrated threshold for 0.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR (+) CIRCUIT SHORTED TO GROUND
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR A SHORT TO GROUND

1. Turn the Ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the Throttle Valve Motor (K314) Actuator (+) circuit at the Throttle Valve Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the Throttle Valve Actuator harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.

7. Start the engine and allow it to reach normal operating temperature.
8. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to .

P1733-00-THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH - POSITIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the Throttle Valve Motor Actuator (+) circuit voltage is below a calibrated threshold for 0.5 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR ACTUATOR (+) CIRCUIT SHORTED TO VOLTAGE
THROTTLE VALVE MOTOR ACTUATOR (+) CIRCUIT OPEN/HIGH RESISTANCE
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the Ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Turn the Ignition on.
4. Measure the voltage on the Throttle Valve Motor (K314) Actuator (+) circuit at the Throttle Valve Actuator harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE MOTOR (K314) ACTUATOR (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the Throttle Valve Motor (K314) Actuator (+) circuit between the Throttle Valve Actuator harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the Throttle Valve Motor (K314) Actuator (+) circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the Throttle Valve Actuator harness connector.

4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P1734-00-THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW - NEGATIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the Throttle Valve Motor Actuator (-) circuit voltage is below a calibrated threshold for 0.45 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR (-) CIRCUIT SHORTED TO GROUND
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE THROTTLE VALVE MOTOR (K315) ACTUATOR (-) CIRCUIT FOR A SHORT TO GROUND

1. Turn the Ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the Throttle Valve Motor (K315) Actuator (-) circuit at the Throttle Valve Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Throttle Valve Motor (K315) Actuator (-) circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the Throttle Valve Actuator harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P1735-00-THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH - NEGATIVE SIDE

For a complete EGR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Throttle Valve (TV) Actuator is an electrically operated throttle valve motor that controls the amount of fresh intake airflow to the Intake Manifold. The TV Actuator is sometimes referred to as the 'EGR Airflow Control Valve'. This does not refer to the 'EGR Valve' (which is a separate device). One function of the TV Actuator is to modulate the quantity of airflow during DPF regeneration for optimal exhaust heat. The Powertrain Control Module (PCM) controls the TV Actuator using DC voltage across 2 H-bridge circuits (+ and -). When the PCM closes the throttle valve (creating a low pressure vacuum in the intake system), this low pressure effect helps draw exhaust gases from the EGR Valve into the intake system. The TV Actuator has an internal position sensor. The PCM receives feedback from the sensor to indicate the position of the throttle blade. The position sensor operates as a typical three wire sensor. During Diesel Particulate Filter (DPF) Regeneration, the EGR Valve is closed and only the Throttle Valve allows (fresh) intake airflow to enter the Intake Manifold.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM detects that the Throttle Valve Motor Actuator (-) circuit voltage is below a calibrated threshold for 0.45 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
THROTTLE VALVE MOTOR ACTUATOR (-) CIRCUIT SHORTED TO VOLTAGE
THROTTLE VALVE MOTOR ACTUATOR (-) CIRCUIT OPEN/HIGH RESISTANCE
THROTTLE VALVE ACTUATOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

- 1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCS.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [**INTERMITTENT DTC**](#) .

2. CHECK THE THROTTLE VALVE MOTOR (K315) ACTUATOR (-) CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the Ignition off.
2. Disconnect the Throttle Valve Actuator harness connector.
3. Turn the Ignition on.
4. Measure the voltage on the Throttle Valve Motor (K315) Actuator (-) circuit at the Throttle Valve Actuator harness connector.

Is the voltage above 12.0 Volts?

Yes

- Repair the Throttle Valve Motor (K315) Actuator (-) circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK THE THROTTLE VALVE MOTOR (K315) ACTUATOR (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance of the Throttle Valve Motor (K315) Actuator (-) circuit between the Throttle Valve Actuator harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the Throttle Valve Motor (K315) Actuator (-) circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE THROTTLE VALVE ACTUATOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Throttle Valve Actuator in accordance with the Service Information.
3. Reconnect the Throttle Valve Actuator harness connector.
4. Reconnect the PCM C2 harness connector.
5. Turn the ignition on.
6. With the scan tool, erase PCM DTCs.
7. Start the engine and allow it to reach normal operating temperature.
8. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The engine oil viscosity is too low.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE OIL CHANGE COUNTER LEVEL TOO LOW

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. REPAIR THE OIL VISCOSITY ISSUE AND RESET THE OIL CHANGE INDICATOR

1. Turn the ignition off.
2. Change the engine oil and filter in accordance with the Service Information.
3. Perform the RESET OIL CHANGE INDICATOR Procedure in - Electrical - Message Systems - Message Center - CENTER, Electronic Vehicle Information - Standard Procedure - RESET OIL CHANGE INDICATOR.
4. Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.
5. With the scan tool, erase the Powertrain Control Module (PCM) DTCs.
6. Cycle the ignition.

Did the oil change Indicator Light reset?

Yes

- Test Complete

No

- Perform the RESET OIL CHANGE INDICATOR Procedure in - Electrical - Message Systems - Message Center - CENTER, Electronic Vehicle Information - Standard Procedure - RESET OIL CHANGE INDICATOR.

P1D49-00-INTERNAL CONTROL MODULE POST INJECTION 2 SHUT OFF ERROR

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an internal failure.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. DTC IS ACTIVE

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Monitor the scan tool for at least two minutes.
4. Cycle the ignition key off and on several times, leaving the ignition on for at least 10 seconds at a time.
5. Start the engine.
6. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle.
7. With the scan tool, select View DTCs.

Did this DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECKING THE PCM POWER AND GROUND CIRCUITS

1. Perform the diagnostic procedure for CHECKING THE PCM POWER AND GROUND CIRCUITS. Refer to **CHECKING THE PCM POWER AND GROUND CIRCUITS**.

Were any problems found?

Yes

- Repair the PCM power and ground circuit(s) as necessary.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **3**

3. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the Powertrain Control Module wiring and connectors.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P1D73-00-AGS PERFORMANCE

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- With the engine running.
- Battery voltage between 11.0 and 16.0 volts.
- Ambient Air Temperature or Engine Coolant Temperature above -7B°C (19.4B°F).

SET CONDITION

- The Powertrain Control Module (PCM) receives a message from the Active Grill Shutter Actuator that the open to close position travel is above 100 degrees or the mechanical stop was detected before the commanded position was reached.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ACTIVE GRILL SHUTTER ACTUATOR POOR ELECTRICAL CONNECTION
ACTIVE GRILL SHUTTER OBSTRUCTED/BINDING

Possible Causes
ACTIVE GRILL SHUTTER ACTUATOR LINKAGE DISCONNECTED/BINDING/BROKEN
ACTIVE GRILL SHUTTER ACTUATOR MOUNTING HARDWARE LOOSE OR MISSING
ACTIVE GRILL SHUTTER ACTUATOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

NOTE: Loose, disconnected or damage Active Grill Shutter (AGS) components are the most common cause for this DTC setting. It is important to check the physical condition and operation of all Active Grill Shutter components.

NOTE: Inspect wiring and connectors for poor connection. A poor connection may cause the module to detect a mechanical stuck condition.

1. Turn the ignition on.
2. With the scan tool, read DTCs and record on the repair order.
3. With the scan tool, erase DTCs.
4. With the scan tool, perform the Active Grill Shutter test.
5. With the scan tool, read DTCs.

Is the DTC active or pending at this time?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ACTIVE GRILL SHUTTER OPERATION

1. Turn the ignition off.
2. Visually inspect the Active Grill Shutter Assembly for the items listed but not limited to the following:
 - Dirt, ice or obstructions that could cause the Active Grill Shutter Assembly to bind causing linkage or shutters to become disconnected
 - Damaged or disconnected Active Grill Shutter Actuator linkages
 - Damaged Active Grill Shutter Assembly frame or shutters
 - Loose or missing Active Grill Shutter Actuator mounting bolts/retainers

Were any problems found?

Yes

- Repair as necessary. With the scan tool, perform the Active Grill Shutter test to validate repair(s).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the Active Grill Shutter Actuator in accordance with the Service Information. With the scan tool, perform the Active Grille Shutter Replaced procedure.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P1E0C-00-EMPTY FUEL TANK

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the Fuel Tank is empty.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) RELATED FUEL LEVEL SENSOR FAILURE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are DTCs P0265-11 or P0265-15 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. CHECK THE LEVEL OF FUEL IN THE FUEL TANK

1. Turn the ignition off.
2. Inspect the Fuel Tank for fuel capacity.

NOTE: If the engine will start and run, fill the fuel tank while monitoring the amount of fuel required to fill. Then, compare this amount to the Fuel Tank capacity specifications. If the actual fill requirements are the same as the capacity, the Fuel Tank inspection result would be: 'empty'.

Did the Fuel Tank inspection show that the tank was empty?

Yes

- This is an indication there is an error in the Fuel Tank Level Sensor reporting to the Body Control Module (BCM). Refer to [**BODY CONTROL MODULE \(BCM\) - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2002-00-DIESEL PARTICULATE FILTER EFFICIENCY BELOW THRESHOLD

THEORY OF OPERATION

The Diesel Particulate Filter (DPF) is designed to physically filter soot and to eliminate hydrocarbons from the engine exhaust gases through catalyst reactions in the exhaust stream. Federal law requires that the filter's efficiency be monitored for signs of degradation that would compromise the efficiency of the filter. The Powertrain Control Module (PCM) monitors the efficiency of the DPF using data received from the Particulate Matter (PM) Sensor which monitors the amount of soot particles that are allowed past the DPF. The PCM will illuminate the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails in two consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine is running.
- With no PM Sensor DTCs.

SET CONDITION

- The Particulate Matter (PM) Sensor has detected an unacceptable amount of soot.

DEFAULT ACTION

- The MIL will illuminate.
- Low Pressure EGR will be turned off.

POSSIBLE CAUSES

Possible Causes
FAILED DIESEL PARTICULATE FILTER (DPF)
PARTICULATE MATTER (PM) SENSOR
PARTICULATE MATTER (PM) SENSOR DTCS PRESENT

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any other DOC/DPF DTCS or PM Sensor DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [2](#)

2. CHECK THE DIESEL PARTICULATE FILTER (DPF) FOR DAMAGE

1. Visually inspect the DPF. Look for signs of soot (black dots) on the outlet side of the filter. This would indicate a crack.

NOTE: Check the back-end of the DPF before the SCR for soot. If there is soot the DPF is damaged.

Was any internal damage found in the DPF?

Yes

- 1. If Yes for soot and cracked DPF check the intake and Charge Air Cooler (CAC) for any leaks. If leaks are found replace the Diesel Particulate Filter (DPF) in accordance with the Service Information. If no leaks are found move to the second option.
- 2. Check the Fuel system for contamination or over-fueling. If issues are found replace the Diesel Particulate Filter (DPF) in accordance with the Service Information.
- 3. If no intake or fuel issues are found replace the Diesel Particulate Filter (DPF) in accordance with the Service Information.

No

- Go To [3](#)

3. REPLACE THE PARTICULATE MATTER (PM) SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the PM Sensor in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCS.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [4](#)

No

- Replacing the faulty PM Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2008-INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT OPEN - BANK 1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open in the Intake Swirl Valve Control circuit for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE CONTROL CIRCUIT OPEN/HIGH RESISTANCE
INTAKE SWIRL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE INTAKE SWIRL VALVE (N117) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Intake Swirl Valve jumper harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the Intake Swirl Valve (N117) Control circuit between the Intake Swirl Valve jumper harness connector and the PCM C2 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the Intake Swirl Valve (N117) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between ground and the Intake Swirl Valve (N117) Control circuit at the Intake Swirl Valve jumper harness connector (main harness side).
3. Turn the ignition on.
4. Using the scan tool, navigate to Actuator Tests and toggle the Intake Swirl Valve.
5. Using the scan tool, view PCM DTCs.

NOTE: The scan tool should display a P2009-Intake Manifold Runner (Swirl) Control Circuit Low DTC as active or pending with the jumper in place.

Did the scan tool display the DTC as describe above?

Yes

- Replace the Intake Manifold in accordance with the Service Information.

NOTE: Before replacing the Intake Swirl Valve, carefully inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2009-00-INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT LOW - BANK 1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Control circuit is shorted to ground for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE CONTROL CIRCUIT SHORTED TO GROUND
INTAKE SWIRL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE INTAKE SWIRL VALVE (N117) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Intake Swirl Valve jumper harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the Intake Swirl Valve (N117) Control circuit at the PCM C2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Intake Swirl Valve (N117) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between the EGR Air Flow Control Valve (N117) Control circuit and the ASD Fused Relay (F343) Output circuit at the Intake Swirl Valve jumper harness connector (main harness side).
3. Turn the ignition on.
4. Using the scan tool, navigate to Actuator Tests and toggle the Intake Swirl Valve.
5. Using the scan tool, view PCM DTCS.

NOTE: The scan tool should display a P2010-Intake Manifold Runner (Swirl) Control Circuit High DTC as active or pending with the jumper in

place.

Did the scan tool display the DTC as describe above?

Yes

- Replace the Intake Manifold in accordance with the Service Information.

NOTE: Before replacing the Intake Swirl Valve, carefully inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P200A-00-INTAKE MANIFOLD RUNNER PERFORMANCE - BANK 1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- 60 seconds after Engine start-up.

SET CONDITION

- The Powertrain Control Module (PCM) detects that a comparison of the Intake Swirl Valve Desired and Measured Positions on Bank 1 (Cylinders 4, 5, & 6) are outside of a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 1
INTAKE SWIRL VALVE (INTAKE MANIFOLD)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, Swirl Valve Actuator, or other Position Sensor 1 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Replace the Intake Manifold and Intake Swirl Valve in accordance with the Service Information.
2. Turn the ignition on.
3. Erase the DTC(s).
4. Start the engine and allow it to idle for up to two minutes.
5. Stop the engine. Leave the ignition on.
6. Using the scan tool, actuate the Intake Swirl Valve by running a full sweep from full closed (5%) to full open (75%).
7. Using the scan tool, view DTCs.

Did the DTC return as Active or Pending?

Yes

NOTE: Before replacing the Intake Manifold, check for excessive buildup or coking in the Intake Manifold that may be causing the Intake Swirl Valve to stick or bind. Also inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Go To [4](#)

No

- Replacing the Intake Manifold and Intake Swirl Valve Position Sensor 1 repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P200B-00-INTAKE MANIFOLD RUNNER PERFORMANCE - BANK 2

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that a comparison of the Intake Swirl Valve Desired and Measured Positions on Bank 2 (Cylinders 1, 2, & 3) are outside of a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 2
INTAKE SWIRL VALVE (INTAKE MANIFOLD)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Supply, Intake Swirl Valve Actuator, or other Position Sensor 2 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Replace the Intake Swirl Valve Position Sensor 2 in accordance with the Service Information.
2. Turn the ignition on.
3. Erase the DTC(s).
4. Start the engine and allow it to idle for up to two minutes.
5. Stop the engine. Leave the ignition on.
6. Using the scan tool, actuate the Intake Swirl Valve.
7. Using the scan tool, view active DTCs.

Did the DTC return?

Yes

NOTE: Before replacing the Intake Manifold, check for excessive buildup or coking in the Intake Manifold that may be causing the Intake Swirl Valve to stick or bind. Also inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Replace the Intake Manifold in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2010-00-INTAKE MANIFOLD RUNNER (SWIRL) CONTROL CIRCUIT HIGH - BANK 1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Control circuit is shorted to voltage for 0.5 second.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE CONTROL CIRCUIT SHORTED TO VOLTAGE
INTAKE SWIRL VALVE CONTROL CIRCUIT SHORTED TO THE ASD RELAY OUTPUT CIRCUIT
INTAKE SWIRL VALVE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE INTAKE SWIRL VALVE (N117) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Intake Swirl Valve jumper harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Intake Swirl Valve (N117) Control circuit at the Intake Swirl Valve jumper harness connector.

Is there any voltage present?

Yes

- Go To [3](#)

No

- Repair the Intake Swirl Valve (N117) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE INTAKE SWIRL VALVE (N117) CONTROL CIRCUIT FOR A SHORT TO THE ASD FUSED RELAY (F343) OUTPUT CIRCUIT

1. Turn the ignition off.
2. Disconnect the PCM C2 harness connector.
3. Measure the resistance between the Intake Swirl Valve (N117) Control circuit and the ASD Fused Relay (F343) Output circuit at the Intake Swirl Valve jumper harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Intake Swirl Valve (N117) Control circuit for a short to the ASD Fused Relay (F343) Output circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE INTAKE SWIRL VALVE FOR PROPER OPERATION

1. Reconnect the PCM C2 harness connector.
2. Connect a jumper between ground and the Intake Swirl Valve (N117) Control circuit at the Intake Swirl Valve jumper harness connector (main harness side).
3. Turn the ignition on.
4. Using the scan tool, navigate to Actuator Tests and toggle the Intake Swirl Valve.
5. Using the scan tool, view PCM DTCs.

NOTE: The scan tool should display a P2009-Intake Manifold Runner (Swirl) Control Circuit Low DTC as active or pending with the jumper in place.

Did the scan tool display the DTC as describe above?

Yes

- Replace the Intake Manifold in accordance with the Service Information.

NOTE: Before replacing the Intake Swirl Valve, carefully inspect the jumper harness and connectors for damage. If any damage is found, replace the jumper harness.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2016-00-INTAKE MANIFOLD RUNNER (SWIRL) POSITION SENSOR CIRCUIT LOW - BANK 1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated

(PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Position Sensor 1 Signal circuit voltage is below a calibrated amount for a calibrated threshold of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO GROUND
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE INTAKE SWIRL VALVE POSITION SENSOR 1 RETURN CIRCUIT
INTAKE SWIRL VALVE POSITION SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 10.0 seconds.
 5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE ISV POSITION SENSOR 1 (N118) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the ISV Position Sensor 1 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the ISV Position Sensor 1 (N118) Signal circuit at the ISV Position Sensor 1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Intake Swirl Valve Position Sensor 1 (N118) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE ISV POSITION SENSOR 1 (N118) SIGNAL CIRCUIT FOR A SHORT TO THE ISV POSITION SENSOR 1 (N122) RETURN CIRCUIT

- 1.
2. Turn the ignition on.
3. Measure the resistance between the ISV Position Sensor 1 (N118) Signal circuit and the ISV Position Sensor 1 (N122) Return circuit at the ISV Position Sensor 1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the short between the Intake Swirl Valve Position Sensor 1 (N118) Signal circuit and the Intake Swirl Valve Position Sensor 1 (N122) Return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE INTAKE SWIRL VALVE POSITION SENSOR 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Intake Swirl Valve Position Sensor 1 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Using the scan tool, actuate the Intake Swirl Valve.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P2017-00-INTAKE MANIFOLD RUNNER (SWIRL) POSITION SENSOR CIRCUIT HIGH - BANK1

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Position Sensor 1 Signal circuit voltage is above a calibrated amount for a calibrated threshold of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
INTAKE SWIRL VALVE POSITION SENSOR 1
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **[3.0L DIESEL - DIAGNOSTIC CODE INDEX](#)** .

No

- Go To [3](#)

3. CHECK THE ISV POSITION SENSOR 1 (N118) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the ISV Position Sensor 1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the ISV Position Sensor 1 (N118) Signal circuit at the ISV Position Sensor 1 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Intake Swirl Valve Position Sensor 1 (N118) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE INTAKE SWIRL VALVE POSITION SENSOR 1 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Intake Swirl Valve Position Sensor 1 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Using the scan tool, actuate the Intake Swirl Valve.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2021-00-INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW BANK 2

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Position Sensor 2 Signal circuit voltage is below a calibrated amount for a calibrated threshold of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO GROUND
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE INTAKE SWIRL VALVE POSITION SENSOR 2 RETURN CIRCUIT
INTAKE SWIRL VALVE POSITION SENSOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCs AND ENVIRONMENTAL DATA - ERASE DTCs AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any 5-Volt Reference DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE ISV POSITION SENSOR 2 (N119) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the ISV Position Sensor 2 harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance between ground and the ISV Position Sensor 2 (N119) Signal circuit at the ISV Position Sensor 2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Intake Swirl Valve Position Sensor 2 (N119) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE ISV POSITION SENSOR 2 (N119) SIGNAL CIRCUIT FOR A SHORT TO THE ISV POSITION SENSOR 2 (N124) RETURN CIRCUIT

1. I
2. Measure the resistance between the ISV Position Sensor 2 (N119) Signal circuit and the ISV Position Sensor 2 (N124) Return circuit at the ISV Position Sensor 2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the short between the Intake Swirl Valve Position Sensor 2 (N119) Signal circuit and the Intake Swirl Valve Position Sensor 2 (N124) Return circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE INTAKE SWIRL VALVE POSITION SENSOR 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Intake Swirl Valve Position Sensor 2 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.

5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Using the scan tool, actuate the Intake Swirl Valve.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2022-00-INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH BANK 2

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Intake Swirl Valve (ISV) Actuator is located under the Intake Manifold. **The ISV Actuator is not accessible without removing the Intake Manifold. There is a short jumper harness from the ISV Actuator that can be accessed for performing checks of the main (Actuator) wiring harness.** The ISV Actuator is used to simultaneously position two flap shafts (one for each engine bank). Each ISV flap shaft has three valves (one for each cylinder). The ISV Actuator is supplied with 12 Volts by the ASD circuit and is controlled by the Powertrain Control Module (PCM) using the Swirl Valve Control circuit which is Pulse Width Modulated (PWM). There are also two ISV Position Sensors which are separate from the ISV Actuator. They are mounted at opposing ends of the Bank 1 and Bank 2 ISV flap shafts. These Position Sensors are monitored by the PCM over the ISV Position Sensor 1 and ISV Position Sensor 2 circuits. The Intake Swirl Valves are used to create turbulence in the air entering the combustion chamber which helps to reduce emissions.

There are two separate approaches used for this monitor: The Standard Heat-Up (SHU) and the Rapid Heat-Up (RHU). Fuel economy and emissions are improved when the engine is allowed to reach a higher temperature. Engine performance and torque are increased when the engine is running at a cooler temperature. The PCM determines which heat-up mode to use based on various conditions.

The PCM uses the P200A-00 monitor when there is an Intake Manifold Runner Performance occurrence during the SHU mode.

The PCM uses the P2D2D-00 monitor when there is an Intake Manifold Runner Performance occurrence during the RHU mode.

Because the PCM switches between SHU and RHU mode, both DTCs may be present when flow-excessive is detected. Both DTCs have the same Diagnostic content.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Intake Swirl Valve Position Sensor 2 Signal circuit voltage is above a calibrated amount for a calibrated threshold of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTAKE SWIRL VALVE (ISV) POSITION SENSOR 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
INTAKE SWIRL VALVE POSITION SENSOR 2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE ISV POSITION SENSOR 2 (N119) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the ISV Position Sensor 2 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the ISV Position Sensor 2 (N119) Signal circuit at the ISV Position Sensor 2 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Intake Swirl Valve Position Sensor 2 (N119) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE INTAKE SWIRL VALVE POSITION SENSOR 2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the Intake Swirl Valve Position Sensor 2 in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Perform several ignition key cycles leaving the ignition on for at least 10 seconds per cycle.
6. Using the scan tool, actuate the Intake Swirl Valve.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P202E-00-REDUCTANT INJECTION VALVE CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- This monitor runs when the DEF Injector is being commanded on.

SET CONDITION

- The Powertrain Control Module detects a mechanical failure of the DEF Injector.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF CRYSTALLIZATION DUE TO LONG OFF TIME
FROZEN DEF
OPEN DEF INJECTOR COIL

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VERIFY DIESEL EXHAUST FLUID (DEF) TANK TEMPERATURE

1. With the scan tool, verify tank temperature.

Is the temperature below 12B°F (-11B°C)?

Yes

- Let vehicle thaw in a warm area, above freezing until the tank temperature reads above 32B°F (0B°C) before continuing diagnosis.
- Go To [3](#)

No

- Go To [3](#)

3. CHECK THE RESISTANCE OF THE DEF INJECTOR

1. Disconnect the DEF injector connector and measure the internal injector resistance.

Is the resistance between 11.4 and 12.6 ohms?

Yes

- Go To [4](#)

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn ignition off.
2. Reconnect all disconnected electrical connectors except for the DEF Injector.
3. Remove the DEF Injector from the exhaust pipe.
4. Reconnect the DEF Injector harness connector.
5. Place the DEF Injector in a container to capture the fluid sprayed.
6. Turn the ignition on.
7. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE:

This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for

the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

8. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- The DEF Injector is functioning properly. Remove the DEF Pressure line from the DEF Injector and DEF Supply Pump Assembly and check the fittings for a partial restriction which could cause an intermittent low flow condition.
- Reset the SCR timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).

An extended test drive (up to 30 miles) may be required in order to ensure that the POWERTRAIN VERIFICATION TEST results are accurate.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2031-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT-BANK 1 SENSOR 2

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/2 is located at the inlet of the Diesel Oxidation Catalyst (DOC). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the DOC. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGT 1/2 Temperature Signal circuit is outside a calibrated voltage for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/2 TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
EGT SENSOR 1/2 GROUND CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE EXHAUST GAS TEMPERATURE SENSOR 2 (K352) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. ISOLATE AND CHECK THE (K914) SENSOR RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE EXHAUST GAS TEMPERATURE SENSOR 1/2 AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty component repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION**.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P2032-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1 SENSOR 2

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/2 is located at the inlet of the Diesel Oxidation Catalyst (DOC). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the DOC. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects that the EGT 1/2 Temperature Signal circuit is below a calibrated voltage for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/2 TEMPERATURE SIGNAL CIRCUIT SHORT TO GROUND
EGT SENSOR 1/2 TEMPERATURE SIGNAL CIRCUIT SHORT TO THE SENSOR GROUND CIRCUIT
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 2 (K352) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the Exhaust Temperature Sensor 2 (K352) Signal circuit at the Exhaust Gas Temperature Sensor 1/2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 2 (K352) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO THE (K914) SENSOR GROUND CIRCUIT

1. Measure the resistance between the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit and the (K914) Sensor Ground circuit at the Exhaust Gas Temperature Sensor 1/2 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit for a short to the (K914) Sensor Ground circuit.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 1/2 FOR PROPER OPERATION

1. Reconnect the PCM C1 harness connector.
2. Reconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
3. Turn the ignition on.
4. With the scan tool, clear DTCs.
5. Turn the ignition off.
6. Disconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
7. Turn the ignition on.
8. With the scan tool, select View DTCs.
9. Monitor the scan tool for at least two minutes.

NOTE: The scan tool should display a P2033-Exhaust Gas Temperature Sensor 1/2 Circuit High DTC as active with the Exhaust Gas Temperature Sensor 1/2 connector unplugged.

Does the scan tool display the DTC as described above?

Yes

- Replace the Exhaust Gas Temperature Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2033-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH - BANK 1 SENSOR 2

For a complete AFTERTREATMENT SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/2 is located at the inlet of the Diesel Oxidation Catalyst (DOC). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the DOC. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the EGT 1/2 Temperature Signal circuit is above a calibrated voltage for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EGT SENSOR 1/2 TEMPERATURE SIGNAL CIRCUIT SHORT TO VOLTAGE
EGT SENSOR 1/2 TEMPERATURE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
SENSOR RETURN CIRCUIT OPEN/HIGH RESISTANCE
EXHAUST GAS TEMPERATURE (EGT) SENSOR 1/2
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 2 (K352) TEMPERATURE SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
3. Turn the ignition on.
4. Measure the voltage of the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit at the Exhaust Gas Temperature Sensor 1/2 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 2 (K352) TEMPERATURE SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance of the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit between the Exhaust Gas Temperature Sensor 1/2 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the Exhaust Gas Temperature Sensor 2 (K352) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE (K914) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K914) Sensor Ground circuit between the Exhaust Gas Temperature Sensor 1/2 harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the (K914) Sensor Return circuit for an open or high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 1/2 FOR PROPER OPERATION

1. Turn the ignition off.
2. Reconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
3. Reconnect the PCM C1 harness connector.
4. Turn the ignition on.
5. With the scan tool, erase DTCs.
6. Turn the ignition off.
7. Disconnect the Exhaust Gas Temperature Sensor 1/2 harness connector.
8. Connect a jumper wire between the (K352) Exhaust Temperature Sensor 2 Signal circuit and the (K914) Sensor Return circuit at the Exhaust Gas Temperature Sensor 1/2 harness connector.
9. Turn the ignition on.
10. With the scan tool, select View DTCs.

NOTE: The scan tool should display a P2032-Exhaust Gas Temperature Sensor Circuit Low DTC with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Exhaust Gas Temperature Sensor 1/2.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P203A-00-REDUCTANT LEVEL SENSOR CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (level portion of the) DEF Level/Temperature Signal circuit is not within a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ICE FORMING INSIDE THE DEF SYSTEM
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (MUST REPLACE ENTIRE DEF TANK)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Level circuit Low or High DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Level/Temperature Sensor Assembly in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P203B-00-REDUCTANT LEVEL SENSOR 1 CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (level portion of the) DEF Level/Temperature Signal circuit is not within a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ICE FORMING INSIDE THE DEF SYSTEM
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (MUST REPLACE ENTIRE DEF TANK)
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Before beginning this Diagnostic Tree, an inspection of the DEF Tank is required to verify the following conditions:

- The fluid level in the DEF Tank must be greater than 1/4 full.
 - The DEF Tank must not be filled all the way to the top (slight air pocket present).
 - The temperature of the fluid in the DEF Tank must be greater than 0B°C (32B°F).
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Level circuit Low or High DTCs or DEF Heater-related DTCs Active or Pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. VISUALLY INSPECT FOR ICE FORMATION IN THE DEF TANK

NOTE: Ice forming on the inside of the DEF Tank can set this DTC.

1. Remove the filler tube to the DEF Tank and visually inspect for the presence of ice crystals forming.

Are there ice crystals forming within the DEF system?

Yes

- Allow the vehicle to remain inside the repair facility long enough for the ice within the DEF System to dissolve. Then, return to Test Step **1. CHECK FOR AN ACTIVE DTC**.

If the DTC does not return, perform the POWERTRAIN VERIFICATION TEST. If the DTC does return, continue this Diagnostic Procedure from the beginning.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. INSTALL A NEW DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (ENTIRE DEF TANK) AND RETEST FOR DTC

1. Turn the ignition off.

2. Install a new DEF Level/Temperature Sensor Assembly in accordance with the Service Information. (Must replace entire DEF Tank).
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P203C-00-REDUCTANT LEVEL SENSOR "A" CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (level portion of the) DEF Level/Temperature Signal circuit is below a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LEVEL/TEMPERATURE SIGNAL SHORT TO GROUND
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF LEVEL/TEMPERATURE (K414) SIGNAL FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DEF Level/Temperature Sensor Assembly harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the Def Level/Temperature (K414) Signal circuit at the DEF Level/Temperature Sensor Assembly harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Def Level/Temperature (K414) Signal circuit for a short to ground. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Level/Temperature Sensor Assembly in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P203D-00-REDUCTANT LEVEL SENSOR "A" CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (level portion of the) DEF Level/Temperature Signal circuit is above a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LEVEL/TEMPERATURE SIGNAL SHORT TO VOLTAGE
DEF LEVEL/TEMPERATURE SIGNAL OPEN/HIGH RESISTANCE
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF LEVEL/TEMPERATURE (K414) SIGNAL FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Level/Temperature Sensor Assembly harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the Def Level/Temperature (K414) Signal circuit and all other circuits at the PCM C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the Def Level/Temperature (K414) Signal circuit for a short to the circuit that measured less than 10k Ohms. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. CHECK THE DEF LEVEL/TEMPERATURE SIGNAL FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the Def Level/Temperature (K414) Signal circuit between the DEF Level/Temperature Sensor Assembly harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the Def Level/Temperature (K414) Signal circuit for an open/high resistance. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Level/Temperature Sensor Assembly in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.

6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P203E-00-REDUCTANT LEVEL SENSOR 1 CIRCUIT INTERMITTENT/ERRATIC

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (level portion of the) DEF Level/Temperature Signal circuit is not within a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK OVERFILLED
ICE FORMING INSIDE THE DEF SYSTEM
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (MUST REPLACE ENTIRE DEF TANK)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Before beginning this Diagnostic Tree, an inspection of the DEF Tank is required to verify the following conditions:

- The fluid level in the DEF Tank must be greater than 1/4 full.

- The DEF Tank must not be filled all the way to the top (slight air pocket present).
 - The temperature of the fluid in the DEF Tank must be greater than 0B°C (32B°F).
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. Ignition on, engine not running.
 4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
 5. Perform several ignition cycles turning the ignition off for at least 60 seconds between each cycle.
 6. Start the engine and allow to reach operating temperature.
 7. Test drive the vehicle under normal operating conditions for a minimum of 10 km (6.2 mi.) on roads with less than a 4% grade.
 8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR AN ACTIVE DTC

NOTE: Before beginning this Diagnostic Tree, an inspection of the DEF Tank is required to verify the following conditions:

- The fluid level in the DEF Tank must be greater than 1/4 full.
 - The DEF Tank must not be filled all the way to the top (slight air pocket present).
 - The temperature of the fluid in the DEF Tank must be greater than 0B°C (32B°F).
1. Ignition on, engine not running.
 2. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
 3. Perform several ignition cycles turning the ignition off for at least 60 seconds between each cycle.
 4. Start the engine and allow to reach operating temperature.
 5. Test drive the vehicle under normal operating conditions for a minimum of 10 km (6.2 mi.) on roads with less than a 4% grade.
 6. With the scan tool, read the PCM DTCs.

Did the DTC return as Active or Pending?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.
- Check the fluid level in the DEF Tank. If the tank is overfilled drain the tank and refill to the appropriate level. Do not overfill the DEF Tank, a slight air pocket must be at the top of the tank. Inform the customer of the proper DEF Tank refill level.

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Level circuit Low or High DTCs or DEF Heater-related DTCs Active or Pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [4](#)

4. VISUALLY INSPECT FOR ICE FORMATION IN THE DEF TANK

NOTE: Ice forming on the inside of the DEF Tank can set this DTC.

1. Remove the filler tube to the DEF Tank and visually inspect for the presence of ice crystals forming.

Are there ice crystals forming within the DEF system?

Yes

- Allow the vehicle to remain inside the repair facility long enough for the ice within the DEF System to dissolve.
- Go To [1](#)

No

- Go To [5](#)

5. INSTALL A NEW DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (ENTIRE DEF TANK) AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new DEF Level/Temperature Sensor Assembly in accordance with the Service Information. (Must replace entire DEF Tank).
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P203F-00-REDUCTANT LEVEL TOO LOW

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) system holds a total of eight gallons of fluid. A series of warning levels to indicate to the customer when the fluid is low or incorrect. The Service DEF System - See Dealer Soon

message will display on the Electronic Vehicle Information Center (EVIC) when the DTC is identified and reported to the Powertrain Control Module (PCM). Once the DTC is logged into the PCM memory, the Warning and Inducement Strategy begins. The Driver Warning and Inducement Strategy for a low fluid condition is as follows: The first warning will occur when the tank level is at approximately three gallons. The customer will here a chime and get an EVIC message reading "LOW DEF REFILL SOON". The second warning level will occur when the tank level is at approximately two gallons. The customer will here a chime and get an EVIC message reading "REFILL DEF ENGINE WILL NOT RESTART IN XXX MILES". If the message is ignored until the tank is empty, the vehicle will not start. The customer will here a chime and get an EVIC message reading "REFILL DEF ENGINE WILL NOT START". **The vehicle will not start until a minimum of two gallons of approved Diesel Exhaust Fluid is added to the tank .**

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The DEF Dosing Control Unit detects that the DEF Tank is low.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DIESEL EXHAUST FLUID TANK LOW

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- The DEF Tank is low. If the vehicle will not start due to the tank being empty, **a minimum of two and a half gallons of approved Diesel Exhaust Fluid** must be added for engine to be started. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P2043-00-REDUCTANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the (temperature portion of the) DEF Level/Temperature Signal circuit is above or below a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any DEF Temperature circuit Low or High DTCS or DEF Tank Heater DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Level/Temperature Sensor Assembly in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCS.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2047-00-REDUCTANT INJECTOR 1/1 CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

Diesel Exhaust Fluid (DEF) System

The Diesel Exhaust Fluid (DEF) System uses an injector to spray fluid into the exhaust stream. The Diesel Exhaust Fluid (DEF) Injector is mounted to the decomposition tube at the inlet of the Selective Catalytic Reduction (SCR), catalytic converter. The Powertrain Control Module (PCM) controls the DEF Injector with a Pulse Width Modulated (PWM) Signal to vary the amount of DEF sprayed into the SCR. The DEF injector operates during the three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line. The injector is open during this time to allow the fluid to return to the tank without creating a vacuum in the line.

The **P202E - Reductant Injection Valve Circuit Performance** fault is a collector style fault. It will set due to an electrical or a mechanical issue with the DEF injector. The two main issues that will cause this DTC to set are the injector needle valve not moving or an injector valve coil plausibility error. The dosing needle movement faults are set during metering control. The dosing coil plausibility check is performed during cold start (before pressure build), by comparing calculated coil temperature with the upstream catalyst temperature. If the difference is greater than a calibrated threshold, the fault will set.

The **P204F - Reductant System Performance** fault is a collector style fault. It will set due to an electrical or pressure related issue in the system. The four main issues that will cause this DTC to set are: Pump stroke time not within expected window of operation, pressure plausibility too high, pressure plausibility too low, or supply pump coil resistance out of specification. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208A - Reductant Pump A Control Circuit Open** fault will be set when there is an open detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208B - Reductant Pump 1 Control Performance** fault will be set when the DEF system is not able to achieve 6.5 bar (94 psi) during the pressure build phase. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled. This is a 1 trip fault.

The **P208C - Reductant Pump A Control Circuit low** fault will be set when a short to ground is detected during any stage of pump operation.

The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P208D - Reductant Pump A Control Circuit High** fault will be set when there is a short circuit to battery detected during any stage of pump operation. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

The **P20E8 - Reductant Pressure Too Low** fault will be set when the pressure drops below 2.5 bar (36 psi) after 5 pressure build attempts during a single drive (key) cycle. The PCM will illuminate the MIL light immediately after the diagnostics run and fail, and at this point, the diesel exhaust fluid injection into the aftertreatment system is disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the difference between the Diesel Exhaust Fluid (DEF) Injector Positive and Negative circuits is more than 1.0 Volt for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF INJECTOR
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: Inspect the Diesel Exhaust Fluid before continuing with this Diagnostic Tree. If there is evidence of contamination or degraded fluid; Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure.

Refer to **DIESEL EXHAUST FLUID EMISSIONS [EXJ], DIAGNOSIS AND TESTING** .

1. Refer to the recorded DTCs.

Are there any P1690, P1691, P1692, or P1693 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DEF INJECTOR HARNESS CONNECTOR FOR DAMAGE

1. Turn the ignition off.

2. Disconnect the PCM C2 harness connector.
3. Disconnect the DEF Injector harness connector.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Reconnect all harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Ignition on, engine not running.
7. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
8. Start the engine and allow to reach operating temperature.
9. Test drive the vehicle during normal operating conditions.
10. With the scan tool, read the PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [4](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the Powertrain Control Module (PCM).
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read the PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) pump operates in three main stages: Pressure Build, Metering Control, and Purge.

Once the SCR Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The Powertrain Control Module (PCM) will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. The PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line.

During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line.

When the DEF system is in pressure control mode, the Powertrain Control Module (PCM) activates the DEF Supply Pump to refill the lines. As the lines fill, the pressure builds to the set point. When the pressure reaches the set point, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. The PCM will illuminate the MIL immediately after the diagnostic runs and fails and diesel exhaust fluid injection into the aftertreatment system is disabled.

The PCM also monitors the DEF pressure to provide correct system performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup cycle will run again.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Selective Catalytic Reduction (SCR) system is at operating temperature.
- During DEF Heating and Metering Control operation.

SET CONDITION

- The PCM detects that the DEF Supply Pump does not meet its calibrated thresholds within a calibrated period of time.

DEFAULT ACTION

- The MIL will illuminate.
- This is a 2 Trip Fault

POSSIBLE CAUSES

Possible Causes
OTHER DEF PUMP DTCS
FUSE F87 OPEN
POWER DISTRIBUTION CENTER
DEF PUMP FLUID LINE LEAK(S)
DEF PUMP SUPPLY VOLTAGE CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
DEF PUMP
DEF FILTER/TANK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: **Verify that the DEF level in the DEF Tank is not too low before beginning this Diagnostic.**

1. Refer to the recorded DTCs.

Are there any other DEF Supply Pump DTCs or DEF Purge Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DIESEL EXHAUST FLUID (DEF) SUPPLY PUMP (F203) SUPPLY VOLTAGE CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the PDC C3 harness connector.
3. Disconnect the DEF Pump C1 harness connector.
4. Measure the continuity of the DEF Supply Pump (F203) Supply Voltage circuit between the PDC C3 harness connector and the DEF Pump Temp/Level Sensor C1 harness connector (at Pump

assembly pins 4 and 1).

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Supply Pump (F203) Supply Voltage circuit for an open/high resistance. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK FUSE F87 FOR AN OPEN

1. Turn the ignition on.
2. Check Fuse F87-10A for an open.

Is the Fuse open?

Yes

- Replace Fuse F87-10A. Then, refer to the Wiring Information and determine where the short circuit is that may have caused the open Fuse.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE DIESEL EXHAUST FLUID (DEF) SUPPLY PUMP (F203) SUPPLY VOLTAGE CIRCUIT WITHIN THE PDC FOR OPEN/HIGH RESISTANCE

1. With the scan tool, activate the DEF Dosing Injection Quantity routine.
2. Leaving Fuse F87 unplugged and the PDC C5 harness connector disconnected, measure the continuity of the relay side of the Fuse to the DEF Supply Pump (F203) Supply Voltage circuit at the PDC side of the PDC C5 harness connector while the DEF Dosing Injection Quantity routine is activated.

Is the resistance below 3.0 Ohms when the routine is activating?

Yes

- Go To [6](#)

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE DEF PUMP SUPPLY/PURGE LINES FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF Pump Supply/Purge lines for leaks.

Are there any leaks present?

Yes

- Repair the DEF Pump Supply/Purge line(s) that are leaking. Then, begin this Diagnostic Tree again starting with the '1. CHECK FOR AN ACTIVE DTC' Test Step.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the DEF Pump in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P206A-00-REDUCTANT QUALITY SENSOR CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Quality Sensor is mounted on the DEF tank and is used to detect the concentration of the DEF. The DEF Quality Sensor shares information with the Powertrain Control Module (PCM) over the Data Link. To determine the DEF concentration, the DEF Quality Sensor uses an internal temperature sensor to measure the temperature of the DEF. After a cold soak and after the engine is initially started, the PCM compares the temperature reading of the DEF Quality Sensor to the Intake Manifold and Coolant Temperature readings. The PCM will illuminate the MIL after the diagnostic runs and fails in 2 consecutive drive cycles. The PCM will turn off the MIL when the diagnostic runs and passes in three consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- The engine must be turned off for a period of eight hours with the block heater not plugged in. This monitor runs when the engine is initially started after the eight hour cold soak.

SET CONDITION

- The PCM detects a 30B°C (86B°F) difference between the DEF Quality Sensor Temperature reading and both the Intake Manifold and Coolant Temperature readings.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF QUALITY SENSOR CONNECTOR CORROSION OR FOREIGN MATERIAL
DEF QUALITY SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

NOTE: If there any DTCs present, perform the Diagnostics for those DTCs before continuing with this one.

NOTE: If is present, perform the Diagnostics for those DTCs before continuing with this one.

Is DTC U02A2-00 present or are there any Intake Manifold Temperature Sensor or Coolant Temperature Sensor DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE DEF QUALITY SENSOR HARNESS CONNECTOR FOR DAMAGE

1. Turn ignition off.
2. Disconnect the DEF Quality Sensor harness connector.

NOTE: Check connectors for corrosion or foreign materials- Clean/repair as necessary.

Are there dirty or damaged pins?

Yes

- Repair/Replace as necessary.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Quality Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P206B-00-REDUCTANT QUALITY SENSOR CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Quality Sensor is welded to the DEF tank and is used to detect the concentration of the DEF. The DEF Quality Sensor shares information with the Powertrain Control Module (PCM) over designated Data Link circuits. To determine the DEF concentration, the DEF Quality Sensor transmits an ultrasonic signal to measure the density of the DEF. It also has an internal temperature sensor to measure the temperature of the DEF. This diagnostic runs continuously with the key on, and the PCM will illuminate the MIL after the diagnostic runs and fails during a drive cycle. The PCM will turn off the MIL after the diagnostic runs and passes in three consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The DEF Quality Sensor detects an internal error or an inability to supply the correct voltage to the sensing element for 5 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT CIRCUIT (ASD CIRCUIT) OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
DEF QUALITY SENSOR

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Is DTC U02A2 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE CHARGING SYSTEM AND BATTERY FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Is the system voltage normal?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE DEF QUALITY SENSOR POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Turn the ignition on, engine not running.
2. Disconnect the DEF Quality Sensor harness connector.
3. Measure the voltage across the ASD Fused Relay (F343) Output circuit and the Ground circuit at the DEF Quality Sensor harness connector.

Does the voltage read within 1.0 volt of Battery voltage?

Yes

- Replace the DEF Quality Sensor in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE ASD FUSED RELAY (F343) OUTPUT CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Leave the ignition on, engine not running.
2. Measure for voltage between ground and the ASD Fused Relay (F343) Output circuit at the DEF Quality Sensor harness connector.

Does the voltage read within 1.0 volt of Battery voltage?

Yes

- Repair the Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the ASD Fused Relay (F343) Output circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P206D-00-REDUCTANT QUALITY SENSOR CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Quality Sensor is welded to the DEF tank and is used to detect the concentration of the DEF. The DEF Quality Sensor shares information with the Powertrain Control Module (PCM) over designated Data Link circuits. To determine the DEF concentration, the DEF Quality Sensor transmits an ultrasonic signal to measure the density of the DEF. It also has an internal temperature sensor to measure the temperature of the DEF. This diagnostic runs continuously with the key on, and the PCM will illuminate the MIL after the diagnostic runs and fails during a drive cycle. The PCM will turn off the MIL after the diagnostic runs and passes in three consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.
- No other DEF or Temperature Sensor DTCs.
- Ambient temperature is above -7B°C (19.4B°F).
- DEF temperature is greater than or equal to 3.94B°C (39.09B°F).
- DEF level is above 15%.
- Tank Heater is not on.

SET CONDITION

- The DEF Quality Sensor output value is greater than 62.5% and the DEF Quality Sensor temperature is above 209.96B°C (409B°F).

NOTE: If the DEF Quality Sensor can not read due to it measuring something other than liquid DEF, it will default to 399.9% on the scan tool value. A damaged sensor could potentially trigger this default value also.

•

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FROZEN DEF
CONTAMINATED DEF
OLD OR STAGNANT DEF IN TANK DUE TO EXTENDED STORAGE
DEF AERATION DUE TO RAPID TEMPERATURE CHANGE, ALTITUDE CHANGE, OR REFILL
DEF QUALITY SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

IS DTC U02A2 active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DEF QUALITY SENSOR DATA INPUT FOR TEMPERATURE

1. Turn the ignition on.
2. Using the scan tool, navigate to data display, monitor the DEF Quality Sensor Temperature.

NOTE: Some scan tools may call this a concentration or quality sensor in the data display.

Is the sensor temperature reading above 100B°C (212B°F)?

Yes

- Go To [8](#)

No

- Go To [4](#)

4. CHECK THE DEF QUALITY SENSOR DATA INPUT FOR CONCENTRATION

1. Using the scan tool, navigate to data display, monitor the DEF Quality Sensor Concentration.

Is the quality/concentration sensor reading above 62.5%?

Yes

- Go To [5](#)

No

- Go To [7](#)

5. CHECK THE DEF QUALITY

1. Turn the ignition off.
2. Collect samples of the DEF from the system or tank.
3. Visually inspect the fluid for signs of contamination or debris.

NOTE: The Refractometer test is only done to test the general quality of the fluid. It will not identify any specific contaminants that may be present.

4. Test the quality of the DEF using the DEF/UREA Refractometer (16-5025) available through MoparEssentialTools.com. Then, ENTER EQUIPMENT CATALOG. Or call (855)-298-2687.

NOTE: The DEF should register between 31.0% and 34% using the Refractometer.

5. Test for hydrocarbons in the DEF tank using a Hydroscopic test paper (223-44-863) available through MoparEssentialTools.com. Then, ENTER EQUIPMENT CATALOG. Or call (855)-298-2687. The test strip must come in contact with the DEF fluid in the tank in order to get a valid reading for hydrocarbons present in tank.
6. Remove the test paper from the package and inspect for color consistency. If the color is not consistent replace strip.
7. Disconnect the DEF fill pipe from tank and try to get a sample or remove the DEF tank.
8. Place the test paper directly into the fluid in the DEF tank. If the light blue paper turns dark blue, that is an indication that oil or hydrocarbon contamination is present.

Is the DEF quality within specification and free of debris, hydrocarbons, or other contamination?

Yes

- Go To [6](#)

No

- If the DEF fails the Refractometer quality test, but passes the Hydrosopic test paper test and shows no other signs of hydrocarbons or other contaminants: Just drain the fluid from the DEF tank and DEF lines. Then, replace it with fresh FCA-approved Diesel Exhaust Fluid (DEF).
- If the DEF fails the Hydrosopic test paper test or shows signs of other contaminants: Drain the DEF. Replace the DEF Tank, DEF Supply Pump Assembly, DEF Injector, DEF Supply Tube, DEF Filler Tube, and DEF Filler Cap in accordance with the Service Information. Perform drive cycle as described in monitor information for diagnostic to make decision.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. REPLACE THE DIESEL EXHAUST FLUID

1. Turn the ignition on, engine not running.
2. Remove the tank and drain all fluid. If frozen, be sure to thoroughly thaw the tank before draining.
3. Flush the tank thoroughly with .5 to 1 gallons of fresh DEF and drain the fluid back out,
4. Re-install the tank and add 3.5 to 5 gallons of fresh DEF.

Is the DEF tank clean and full of DEF?

Yes

- Go To [7](#)

No

- Go To [6](#)

7. PERFORM A DRIVE CYCLE AND CHECK FOR ACTIVE DTC

1. Perform drive cycle as described in the Monitor information at the top for the diagnostic to make a decision.
2. Turn the ignition on, engine not running.
3. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [8](#)

No

- Adding fresh DEF to the tank corrected the issue.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

8. REPLACE THE DEF TANK / CONCENTRATION SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the DEF Tank in accordance with the Service Information.
3. Perform drive cycle as described in the Monitor information at the top for the diagnostic to make a decision.

4. Turn the ignition on.
5. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Review monitor conditions and repeat drive cycle.

No

- Replacing the faulty Sensor/DEF Tank repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2080-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor or thermistor resistance is high. When the exhaust gas temperature is hot, the sensor resistance is low. Exhaust Gas Temperature Sensor 1/1 is located at the outlet of the Exhaust Manifold. It sends a signal to the PCM indicating the temperature of the exhaust gases exiting the Exhaust Manifold. This is a 1-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM will also disable active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Sensor 1/1 reading is not increasing with engine operating temperature after engine startup.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE SENSOR 1/1

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are either of the Exhaust Gas Temperature Sensor 1/1 Low or High DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE EXHAUST GAS TEMPERATURE SENSOR 1/1 FOR PROPER OPERATION

1. Remove the Exhaust Gas Temperature Sensor 1/1 and reconnect the harness connector to the sensor. Monitor the scan tool, while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the sensor increase at least 5B°F on the scan tool?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

No

- Replace the Exhaust Gas Temperature Sensor 1/1 in accordance with the Service Information.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS P2084-00 To P2251-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

P2084-00-EXHAUST GAS TEMPERATURE SENSOR CIRCUIT PERFORMANCE - BANK 1 SENSOR 2

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

There are four Exhaust Gas Temperature Sensors (#1, #2, Catalyst, and #3) used by the Powertrain Control Module (PCM) to monitor engine exhaust temperatures in the aftertreatment system. These 2-wire/5-Volt sensors are thermistors and change resistance based on the temperature being measured. When the exhaust gas temperature is cold, the sensor thermistor resistance is high. When the exhaust gas temperature is hot, the sensor thermistor resistance is low. Exhaust Gas Temperature Sensor 1/2 is located at the inlet of the Diesel Oxidation Catalyst (DOC). It sends a signal to the PCM indicating the temperature of the exhaust gases entering the DOC. This is a 2-trip fault. The PCM illuminates the MIL lamp immediately when the diagnostic runs and fails. The PCM also disables active regeneration mode. The PCM will turn off the MIL lamp after the diagnostic runs and passes on four consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Exhaust Gas Temperature Sensor 1/2 reading is not increasing with engine operating temperature after engine startup.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
EXHAUST GAS TEMPERATURE SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are either of the Exhaust Gas Temperature Sensor 1/2 Low or High DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE EXHAUST TEMPERATURE SENSOR 1/2 FOR PROPER OPERATION

1. Remove the Exhaust Gas Temperature Sensor 1/2 and reconnect the harness connector to the sensor. Monitor the scan tool, while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the sensor increase at least 5B°F on the scan tool?

Yes

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

No

- Replace the Exhaust Gas Temperature Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P208A-00-REDUCTANT PUMP -A- CONTROL CIRCUIT OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

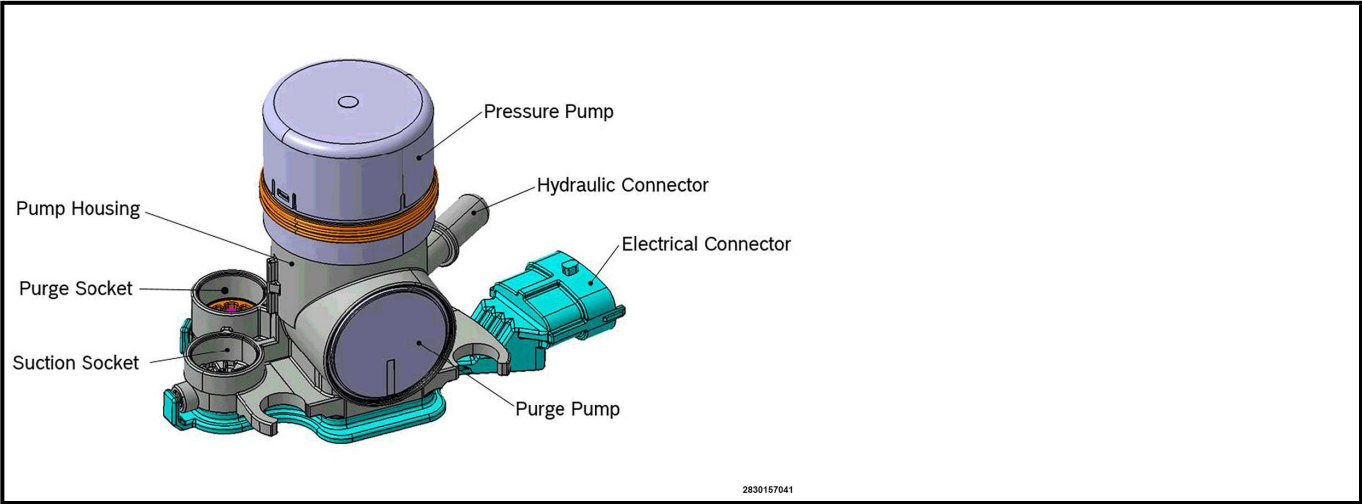
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134B°C (273B°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11B°C (12B°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the DEF Supply Pump Control circuit for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF SUPPLY PUMP CONTROL CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF SUPPLY PUMP (K482) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the DEF Pump-Level/Temp Sensor C1 harness connector.
3. Disconnect the appropriate PCM harness connector.
4. Measure the resistance of the DEF Supply Pump (K482) Control circuit between the DEF Pump-Level/Temp Sensor C1 harness connector and the PCM harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Supply Pump (K482) Control circuit for an open or high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE FUSED IGNITION (F203) OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Ensure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.

5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

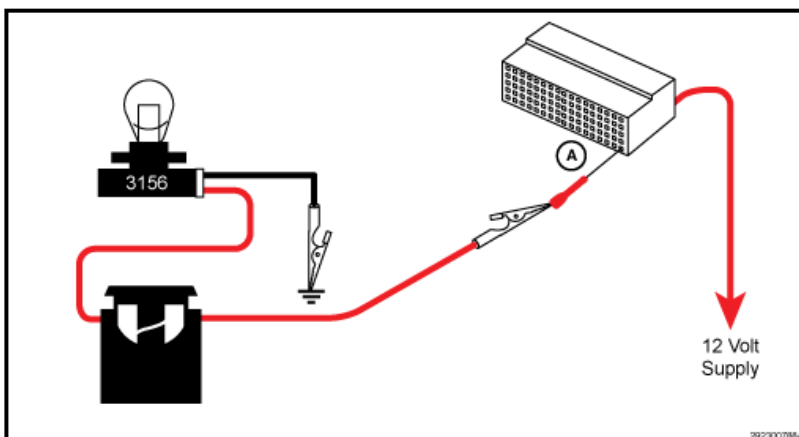
NOTE: Why perform a Voltage Drop Test? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .



NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [4](#)

No

- Repair the 12.0 volt circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE DEF PUMP FOR PROPER OPERATION

1. Replace the DEF Pump in accordance with the Service Information.
2. Reconnect the DEF Pump-Level/Temp Sensor C1 harness connector.
3. Reconnect the PCM harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [5](#)

No

- Test Complete. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P208B-00-REDUCTANT PUMP 1 CONTROL PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

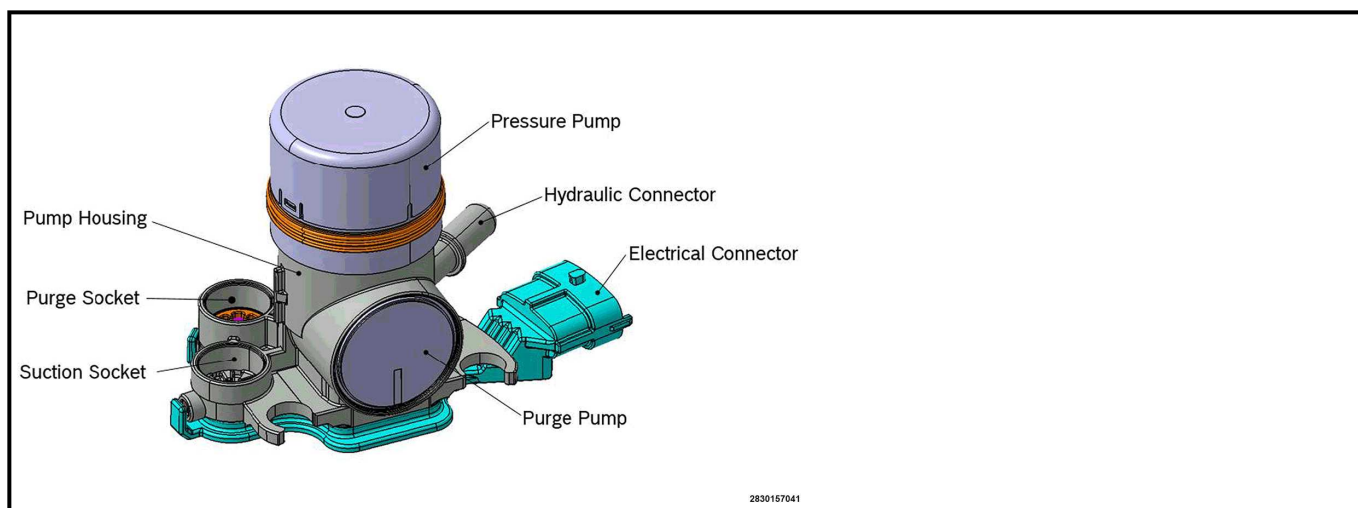
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134B°C (273B°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11B°C (12B°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Vehicle is being driven.
- Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that a comparison between the DEF Pump pressure and Ambient pressure is above or below a calibrated threshold for a calibrated amount of time. This DTC will also set if the comparison shows no change at all or the Pump fails to build pressure for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK CAVITATION (IMPROPER TANK BLEEDING)
FROZEN DEF
LOW DEF TANK LEVEL
CONTAMINATED DEF
DEF LINE LEAKING OR RESTRICTED
DEF INJECTOR
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

NOTE: **Inspect the Diesel Exhaust Fluid before continuing with this Diagnostic Tree. If there is evidence of contamination or degraded fluid; Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure.**

Refer to [DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING](#) .

Ignition on, engine not running.

Are there any other DEF Supply Pump DTCs or are DTCs P208A, P208C, or P208D active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DIESEL EXHAUST FLUID

1. Check the DEF for the following conditions:
 - Frozen DEF. (Frozen DEF can potentially cause cavitation in the tank if the ambient temperature is drastically low.)
 - Low DEF level.
 - Recent DEF Pump or line replacement. (If the Pump or Line was recently replaced this can cause a potential for air to cause a fault.)

Were there any issues found with the DEF?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. CHECK THE DEF PUMP SUPPLY LINES FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF Pump Supply lines for leaks.

Are there any leaks present?

Yes

- Repair the DEF Pump Supply line(s) that are leaking. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the POWERTRAIN VERIFICATION Test. Then, begin this Diagnostics again starting with the 'DTC IS ACTIVE' Test Step.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE DEF PUMP FOR PROPER OPERATION

1. Turn the ignition on.
2. Using the scan tool perform "DEF Dosing Injection Quantity" test.

NOTE: When the DEF Injector (Dosing Valve) Actuator Test is initiated, the DEF Injector is opened. Wait 30 seconds before checking for leaks.

Did the test abort or fail to build pressure prior to dosing?

Yes

- Replace the DEF Pump. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE DEF INJECTOR FOR PROPER OPERATION

1. Turn the ignition on.
2. Remove the DEF injector from the exhaust in accordance with the Service Information.
3. Connect DEF injector lines and connectors.
4. Using the scan tool perform "DEF Dosing Injection Quantity" test.
5. Capture the DEF fluid injected during the routine.

Was the captured amount of fluid between 26-35 ml (0.88-1.18 oz)?

No

- Replace the DEF Injector. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

Yes

- Go To [7](#)

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

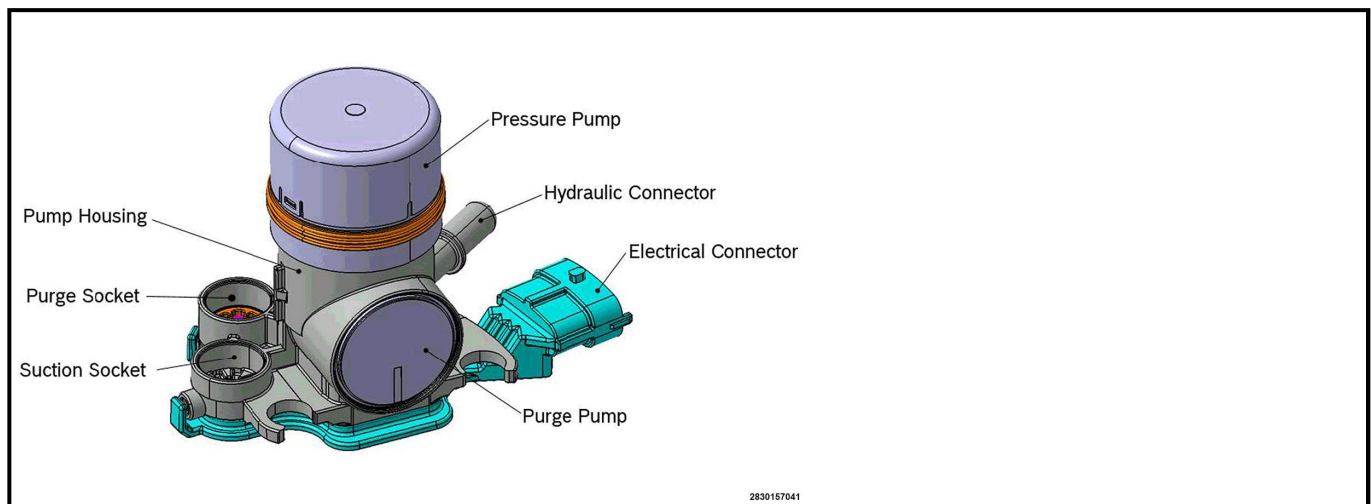
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134B°C (273B°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11B°C (12B°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects less than 2.0 Volts on the DEF Supply Pump Control circuit for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF SUPPLY PUMP CONTROL CIRCUIT SHORT TO GROUND
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE DEF SUPPLY PUMP (K482) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DEF Pump C1 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the DEF Supply Pump (K482) Control circuit at the DEF Pump C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the DEF Supply Pump (K482) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. CHECK THE DEF PUMP FOR PROPER OPERATION

1. Replace the DEF Pump in accordance with the Service Information.
2. Reconnect the DEF Pump C1 harness connector.
3. Reconnect the PCM C1 harness connector.

4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P208D-00-REDUCTANT PUMP -A- CONTROL CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

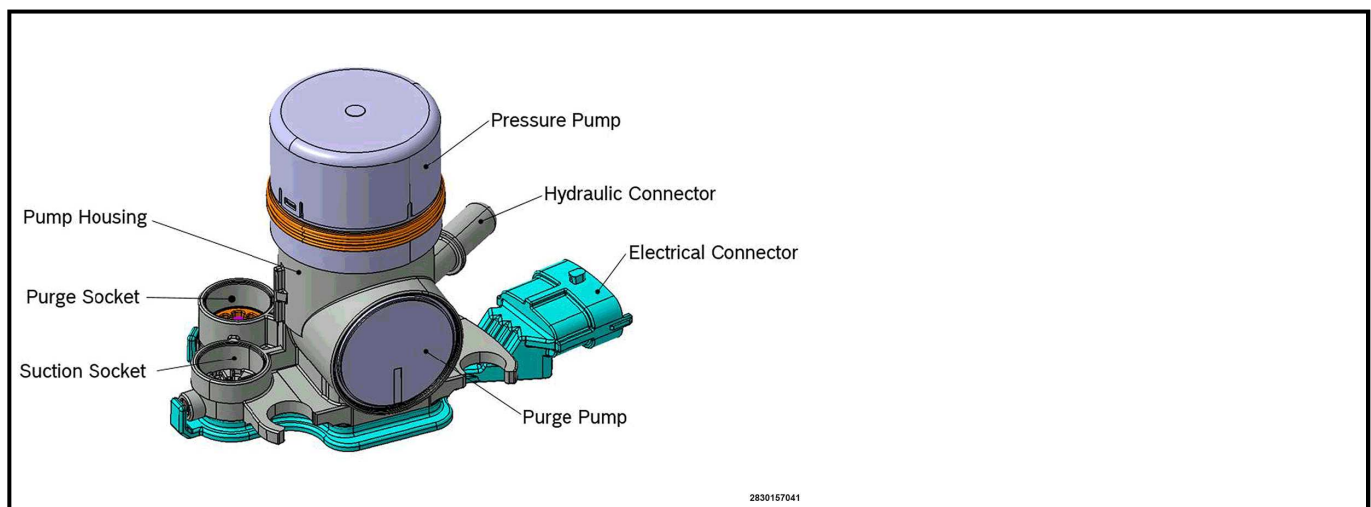
THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Module (PCM).

Once the SCR Catalyst reaches operating temperature of 134B°C (273B°F), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 4.5 - 8.5 bar (65 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at -11B°C (12B°F) and its concurrent expansion has potential to damage the pressure line.



WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the DEF Supply Pump Control circuit is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF SUPPLY PUMP CONTROL CIRCUIT SHORT TO VOLTAGE
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE DEF SUPPLY PUMP (K482) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Pump C1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Supply Pump (K482) Control circuit at the DEF Pump C1 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the DEF Supply Pump (K482) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE DEF PUMP FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Pump in accordance with the Service Information.
3. Reconnect the DEF Pump C1 harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P20B9-00-REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the DEF Tank Heater Supply circuit for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK HEATER SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
DEF TANK HEATER SUPPLY CIRCUIT SHORT TO GROUND
DEF TANK HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the DEF Tank Heater harness connector.
3. Disconnect the HCU harness connector.
4. Measure the resistance of the DEF Tank Heater (K403) Supply circuit between the DEF Tank Heater harness connector and the HCU harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Tank Heater (K403) Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the DEF Tank Heater (K403) Supply circuit at the DEF Tank Heater harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Tank Heater (K403) Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE DEF TANK HEATER ASSEMBLY FOR PROPER OPERATION

1. Replace the DEF Tank Heater Assembly in accordance with the Service Information.
2. Reconnect the DEF Tank Heater harness connector.
3. Reconnect the HCU harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the DEF Tank Heater Assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20BA-00-REDUCTANT HEATER 1 CONTROL CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the largest calculated Pressure Tank Heater circuit conductance is greater than or less than a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are DTCS P20B9, P20BB, or P20BC active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE ASD FUSED RELAY (F343) OUTPUT CIRCUIT, (A914) FUSED B+ CIRCUIT AND THE (Z909) GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the ignition on, engine off.
2. Measure the voltage across the ASD Fused Relay (F343) Output circuit and the (Z909) Ground circuit at the DEF HCU harness connector. Then, measure the voltage across the (A914) Fused B+ circuit and the (Z909) Ground circuit at the DEF HCU harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the ASD Fused Relay (F343) Output circuit or the (A914) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE WIRE HARNESS AND CONNECTORS FOR DAMAGED

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF HCU and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL UNIT (HCU) FOR PROPER OPERATION

1. Replace the Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [6](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20BB-00-REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the voltage on the DEF Tank Heater Supply circuit is below a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK HEATER SUPPLY CIRCUIT SHORT TO GROUND
DEF TANK HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DEF Tank Heater harness connector.
3. Disconnect the HCU harness connector.
4. Measure the resistance between ground and the DEF Tank Heater (K403) Supply circuit at the DEF Tank Heater harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the DEF Tank Heater (K403) Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE DEF TANK HEATER ASSEMBLY FOR PROPER OPERATION

1. Replace the DEF Tank Heater Assembly in accordance with the Service Information.
2. Reconnect the DEF Tank Heater harness connector.
3. Reconnect the HCU harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the DEF Tank Heater Assembly repaired the fault.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20BC-00-REDUCTANT SUCTION LINE HEATER CONTROL CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the DEF Tank Heater Supply circuit is above 5.0 Volts for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF TANK HEATER SUPPLY CIRCUIT SHORT TO VOLTAGE
DEF TANK HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Tank Heater harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Tank Heater (K403) Supply circuit at the DEF Tank Heater harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the DEF Tank Heater (K403) Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. CHECK THE DEF TANK HEATER ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Tank Heater Assembly in accordance with the service information.
3. Reconnect the DEF Tank Heater harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the DEF Tank Heater Assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20BD-00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT/OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the DEF Line Heater Supply circuit for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
DEF LINE HEATER SUPPLY CIRCUIT SHORT TO GROUND
DEF LINE HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCS.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the DEF Line Heater harness connector.
3. Disconnect the HCU harness connector.
4. Measure the resistance of the DEF Line Heater (K404) Supply circuit between the DEF Line Heater harness connector and the HCU harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the DEF Line Heater (K404) Supply circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the DEF Line Heater (K404) Supply circuit at the DEF Tank Heater harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the DEF Line Heater (K404) Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE DEF LINE HEATER ASSEMBLY FOR PROPER OPERATION

1. Replace the DEF Line Heater Assembly in accordance with the Service Information.
2. Reconnect the DEF Line Heater harness connector.
3. Reconnect the HCU harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replacing the DEF Line Heater Assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P20BE-00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM detects that the largest calculated Pressure Line Heater circuit conductance is greater than or less than a calibrated threshold for 0.1 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P20BD, P20BF, or P20C0 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF LINE HEATER ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Line Heater Assembly in accordance with the Service Information.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Start the engine.
6. Allow the engine to reach normal operating temperature.
7. Monitor the scan tool for at least two minutes.
8. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the DEF Line Heater Assembly repaired the fault.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20BF-00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the voltage on the DEF Line Heater Supply circuit is below a calibrated threshold for a calibrated amount of time. This is a two Trip Fault

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORT TO GROUND
DEF LINE HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DEF Line Heater harness connector.
3. Disconnect the HCU harness connector.
4. Measure the resistance between ground and the DEF Line Heater (K404) Supply circuit at the DEF Line Heater harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the DEF Line Heater (K404) Supply circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE DEF LINE HEATER ASSEMBLY FOR PROPER OPERATION

1. Replace the DEF Line Heater Assembly in accordance with the Service Information.
2. Reconnect the DEF Line Heater harness connector.
3. Reconnect the HCU harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replacing the DEF Line Heater Assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20C0-00-REDUCTANT PRESSURE LINE HEATER CONTROL CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the DEF Line Heater Supply circuit is above 5.0 Volts for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORT TO VOLTAGE
DEF LINE HEATER ASSEMBLY
DEF HEATER CONTROL UNIT (HCU)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.

6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Line Heater harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Line Heater (K404) Supply circuit at the DEF Line Heater harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the DEF Line Heater (K404) Supply circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. CHECK THE DEF LINE HEATER ASSEMBLY FOR PROPER OPERATION

1. Turn the ignition off.
2. Replace the DEF Line Heater Assembly in accordance with the Service Information.
3. Reconnect the DEF Line Heater harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Replace the Heater Control Unit (HCU) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replacing the DEF Line Heater Assembly repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM compares the DEF Tank temperature on initial startup to a pre-determined DEF operating time. If the temperature comparisons are greater than or less than a calibrated threshold for a calibrated amount of time, this DTC will set. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OTHER DEF HEATER OR DEF PUMP DTCS SETTING
DEF LEVEL/TEMPERATURE SENSOR 12 VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
DEF LEVEL/TEMPERATURE SENSOR 12 VOLT SUPPLY CIRCUIT SHORT TO GROUND
DEF LEVEL/TEMPERATURE SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
DEF TANK

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN
 1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Turn the ignition off for a minimum of 75.0 seconds.
 5. Turn the ignition on.
 6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
 7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Pump DTCs, or are DTCs P20B9, P20BB, or P20BC active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE ASD FUSED RELAY (F343) OUTPUT CIRCUIT AND THE (Z909) GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the DEF HCU harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the ASD Fused Relay (F343) Output circuit and the (Z909) Ground circuit at the DEF HCU harness connector.

Was the voltage the same as battery voltage (+/- 1.0 Volt)?

Yes

- Replace the DEF Tank in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the ASD Fused Relay (F343) Output circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P20C6-00-REDUCTANT HEATER 4 CONTROL CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF

Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM determines that the DEF Purge Pump activates more often than it should within a pre-determined amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OTHER DEF PUMP DTCS SETTING
DEF SUPPLY LINE BLOCKAGE
DEF PUMP

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other DEF Pump DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF SUPPLY LINE FOR BLOCKAGE

1. Turn the ignition off.
2. Inspect the DEF Supply line for blockage or pinching.

Was there any blockage present in the DEF Supply line?

Yes

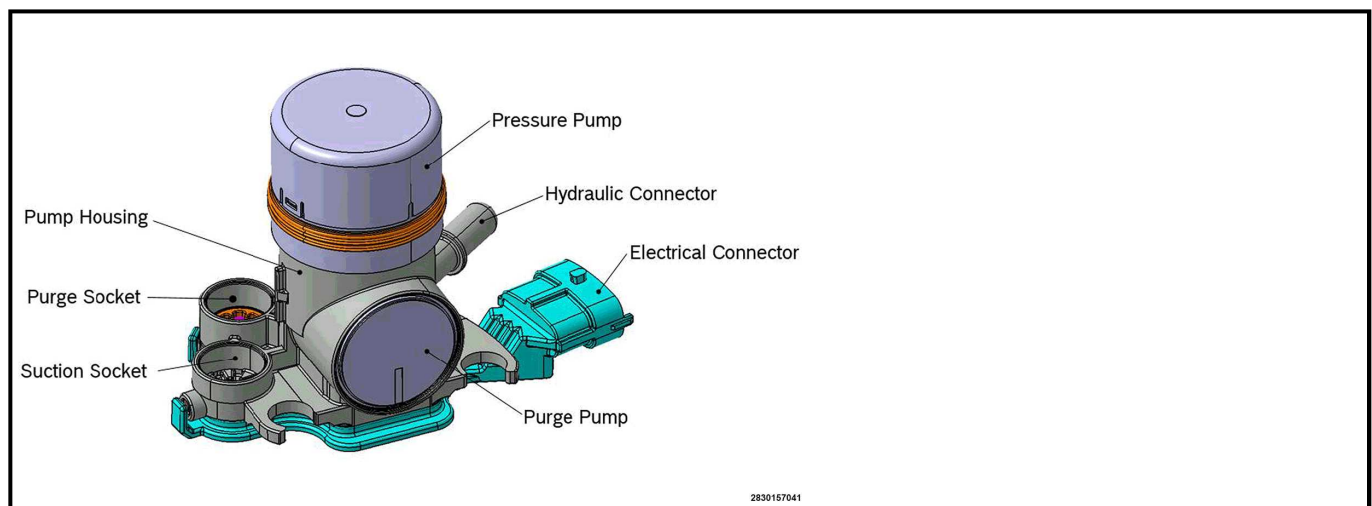
- Repair or replace the DEF Supply line as needed.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20E8-00-REDUCTANT PRESSURE TOO LOW

THEORY OF OPERATION



The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Unit (PCM).

Once the Selective Catalyst Reduction (SCR) Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- SCR at operating temperature.
- During DEF Metering control.

SET CONDITION

- The DEF fluid is below 2.5 bar (36 psi) after 5 consecutive occurrences during a single drive cycle.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DIESEL EXHAUST FLUID LEVEL
CONTAMINATED DIESEL EXHAUST FLUID
DEF PRESSURE LINE DAMAGED/LEAKING
DEF INJECTOR PHYSICALLY STUCK OPEN
DEF PUMP SUCTION SOCKET O-RING OUT OF PLACE/DAMAGED
DEF SUPPLY PUMP ASSEMBLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK THE DEF TANK LEVEL AND FLUID

NOTE: Inspect the Diesel Exhaust Fluid before continuing with this Diagnostic Tree. If there is evidence of contamination or degraded fluid; Perform the Diagnosis and Testing - Diesel Exhaust Fluid procedure.

Refer to **DIESEL EXHAUST FLUID EMISSIONS [EXJ], DIAGNOSIS AND TESTING** .

1. Verify the DEF Tank level.
2. Check the fluid for signs of contamination.

Is the fluid level in the DEF Tank above the minimum requirement and free of contamination?

Yes

- Go To [2](#)

No

- Fill the DEF Tank to the proper level with clean Diesel Exhaust Fluid. If the fluid is contaminated, perform the cleaning procedure.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

2. VERIFY DIESEL EXHAUST FLUID (DEF) TANK TEMPERATURE

1. With the scan tool, verify tank temperature.

Is the temperature below 12B°F (-11B°C)?

Yes

- Let vehicle thaw in a warm area, above freezing until the tank temperature reads above 32B°F (0B°C) before continuing diagnosis.
- Go To [3](#)

No

- Go To [3](#)

3. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, record all Freeze frame data and record all DTCs on the repair order.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on, run the engine to operating temperature
6. Test drive the vehicle under normal operating conditions to induce the DEF system.
7. With the scan tool check for active DTCs.

Is the DTC active?

Yes

- Go To [4](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

4. CHECK THE DEF PUMP SUPPLY LINES FOR LEAKS OR RESTRICTIONS

1. Turn the ignition on.
2. With the scan tool, navigate to Systems Tests and actuate the Diesel Exhaust Fluid Injector Quantity Test.
3. Visually inspect the DEF Pump Supply lines for leaks or restrictions.

Are there any leaks or restrictions present?

Yes

- Repair the DEF Pump Supply line for a leak or restriction. Reset the SCR Timer: With the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the POWERTRAIN VERIFICATION TEST.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF PUMP ASSEMBLY

1. Stop actuation of the Diesel Exhaust Fluid Injector Quantity Test.
2. Reconnect all the DEF lines.
3. Turn the ignition off.
4. Remove the DEF Injector from the exhaust pipe.
5. Inspect and remove any crystallization build-up on the exhaust side of the injector.
6. Place the DEF Injector in a container to capture the fluid sprayed.
7. Turn the ignition on.
8. With the scan tool, navigate to Systems Tests and actuate the DEF Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test; therefore, the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

9. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26ml and 35ml?

Yes

- Repair complete. Reset the SCR Timer: With the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the POWERTRAIN VERIFICATION TEST.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. REPLACE THE DEF INJECTOR

1. Replace the DEF Injector.
2. Place the DEF injector in a container to capture the fluid sprayed.
3. Turn the ignition on.
4. With the scan tool, navigate to Systems Tests and actuate the DEF Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test; therefore, the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist.

There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26ml and 35ml?

Yes

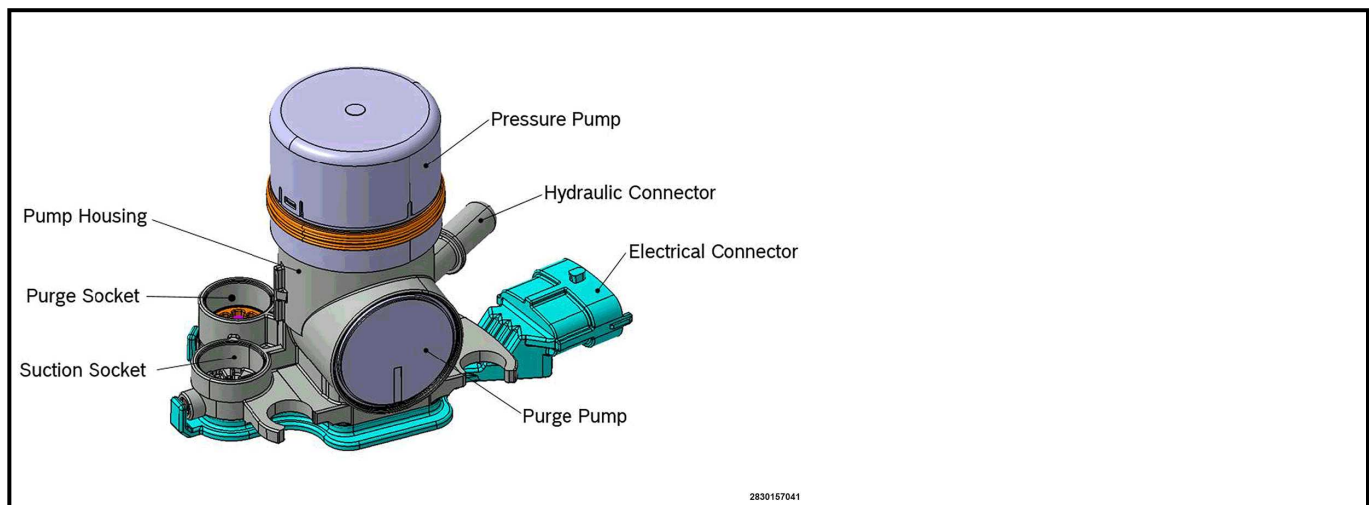
- Repair complete. Reset the SCR Timer: With the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the POWERTRAIN VERIFICATION TEST.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the supply line and run the Override Test again. If the test fails with the new line, then replace the DEF Pump Assembly in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM Verification Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P20E9-00-REDUCTANT PRESSURE TOO HIGH

THEORY OF OPERATION



The Diesel Exhaust Fluid (DEF) System uses a solenoid style pump. There are two separate solenoids inside the pump, one for the pressure pump and the purge pump. The pressure pump is used to pressurize the system and deliver a supply of DEF to the DEF injector. The purge pump runs for a brief time after the vehicle has been shut down to remove DEF from the supply line. The DEF pump operates in three main stages: Pressure Build, Metering Control, and Purge.

There is no pressure sensor in the system, rather pressure is a modeled calculation based off the amperage draw and the duration of the pump stroke. The higher the amperage and the longer the stroke, the higher the pressure is. Pressure seen on the scan tool is a calculation performed by the Powertrain Control Unit (PCM).

Once the Selective Catalyst Reduction (SCR) Catalyst reaches operating temperature of 273B°F (134B°C), the PCM will begin the pressure build phase. The PCM will activate the DEF Supply Pump to refill the line. As the line fills, the pressure builds to the set point. Then, the PCM turns on the DEF Injector to bleed air out of the Pressure Line. Each time the injector is turned off, the PCM monitors the amount of time it takes for the

pressure to rise back to the set point to determine when all of the air is bled out of the line. During Metering Control, the PCM adjusts pump run time to maintain a steady pressure between 6.5 - 8.5 bar (94 - 123 psi).

When the engine is shut off, the Purge pump will activate. The purpose is to draw the DEF back into the tank to protect the line. DEF will freeze at 12B°F (-11B°C) and its concurrent expansion has potential to damage the pressure line.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.
- SCR at operating temperature.
- During a Metering Control event.

SET CONDITION

- The PCM detects that the pressure in the system exceeds 8.5 - 10 bar (124 - 145 psi) after 3 pressure build attempts.

DEFAULT ACTION

- The MIL will illuminate.
- DEF injection into the Aftertreatment system is disabled.

POSSIBLE CAUSES

Possible Causes
DEF CONTAMINATION
DEF INJECTOR RESTRICTION OR BLOCKAGE
FROZEN DEF IN PRESSURE LINE AND/OR TANK
SUPPLY LINE HEATER INOPERABLE
DEF LINE OR FITTINGS RESTRICTED
DEF SUPPLY PUMP ASSEMBLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR OTHER DTCS

1. Before continuing on with further diagnosis, address any of the following DTCs: P05ED - Reductant Heater Control Module Supply Voltage, P2043 - Reductant Temperature Sensor Circuit Performance, P20BA - Reductant Heater 1 Control Circuit Performance, P20BB - Reductant Suction Line Heater Control Circuit Low, P20BC - Reductant Suction Line Heater Control Circuit High, P20BD - Reductant Pressure Line Heater Control Circuit/Open, P20BE - Reductant Pressure Line Heater Control Circuit Performance, P20BF - Reductant Pressure Line Heater Control Circuit Low, P20C0 - Reductant Pressure Line Heater Control Circuit High, P20C2 - Reductant Heater 3 Control Circuit Performance, P20C6 - Reductant Heater 4 Control Circuit Performance.

Are there any of the listed DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [2](#)

2. VERIFY AMBIENT TEMPERATURE

1. Turn the ignition on.
2. With the scan tool, verify tank temperature.

Is the temperature below 32B° F (0B° C)?

Yes

- Let the vehicle thaw in the shop to ambient conditions before continuing diagnosis.
- Go To [3](#)

No

- Go To [3](#)

3. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Inspect the Diesel Exhaust Fluid before continuing with this Diagnostic Tree. If there is evidence of contamination or degraded fluid; Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure.

Refer to **DIESEL EXHAUST FLUID EMISSIONS [EXJ], DIAGNOSIS AND TESTING** .

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for 75 seconds.
5. Turn the ignition on, run the engine and SCR to operating temperature.
6. Test drive the vehicle under normal operating conditions to induce the DEF system.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [4](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

4. CHECK THE DEF LINES AND FITTINGS FOR LEAKS OR RESTRICTIONS

1. Turn the ignition off.
2. Visually inspect the DEF lines and fittings for signs of damage, including leaks, restricted lines, pinched lines.
3. Remove the lines from the fittings at the DEF Supply Pump Assembly and the DEF Injector and inspect the fitting for signs of crystallization or blockages.

Were any leaks or blockages found?

Yes

- Repair or replace the leaking or blocked lines or fittings as necessary. If P241D is active, then perform: Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM Verification Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [5](#)

5. CHECK THE DEF PUMP ASSEMBLY

1. Reconnect all of the DEF lines.
2. Remove the DEF Injector from the Exhaust pipe.
3. Inspect and remove any crystallization build-up on the exhaust side of the injector.
4. Place the DEF Injector in a container to capture the fluid sprayed.
5. Turn the ignition on.
6. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

7. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Repair complete. If P241D is active, then perform: Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.

No

- Go To [6](#)

6. REPLACE THE DEF INJECTOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the DEF Injector in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, navigate to the Diesel Exhaust Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test; therefore, the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist.

There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

5. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Repair complete. If P241D is active, then perform: Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.

No

- Replace the supply line and run the Override Test again. If the test fails with the new line, then replace the DEF Pump Assembly in accordance with Service Information. If P241D is active, then perform: Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer). Also, test drive the vehicle for 30 miles before beginning the PCM VERIFICATION Test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P20EE-00-SCR NOX CATALYST EFFICIENCY BELOW THRESHOLD BANK 1

THEORY OF OPERATION

There are two Nitrogen Oxide (NOx) Sensors in the Exhaust System used to monitor Selective Catalyst Reduction (SCR) system efficiency. The SCR system includes, but is not limited to, the SCR Catalyst, Diesel Exhaust Fluid (DEF) injector, and the Exhaust Gas Temperature (EGT) Sensors. Physical issues or circuit DTCs with any of DEF, Particulate Matter (PM), or EGT Sensor(s) should be addressed before continuing with any Performance or Efficiency related DTC.

The Upstream NOx Sensor 1/1 is mounted on the Exhaust between the Turbocharger and the SCR Catalyst. The Downstream NOx Sensor 1/2 is mounted after the SCR Catalyst on the Exhaust. Both Sensors have a harness and module that are not interchangeable with each other or service separately.

NOTE: During coast-downs or deceleration events the both NOx Sensor values on the scan tool should read 0 ppm or very close to 0 ppm. The engine does not produce any NOx during coast-downs as there is zero fueling occurring during coast-downs. During idle and when the Exhaust Temperature Sensors are all reading about 150B°C (302B°F) both NOx Sensor ppm values should be similar, but NOx Sensor 2 should never be higher than NOx Sensor 1.

WHEN MONITORED

NOTE: When the ambient air temperature is greater than 0B°C (32B°F) the DEF system will start dosing once the exhaust system has reached a temperature 150B°C (302B°F) or above. If the ambient air temperature is less than 0B°C (32B°F) the DEF system dosing will start after a defrost cycle. The defrost cycle is initiated by driving the vehicle. For an ambient air temperature of -20B°C (-4B°F) 1 hour of driving is required for the defrost cycle to complete, an ambient air temperature of -15B°C (5B°F) requires 40 minutes of driving for the defrost cycle to complete, an ambient air temperature of -7B°C (19.4B°F) requires 20 minutes of driving for the defrost cycle to complete, and an ambient air temperature of -5B°C (23B°F) requires 5 minutes of driving for the defrost cycle to complete.

This diagnostic runs continuously when the following conditions are met:

- NOx Sensors are active and the DEF system is injecting UREA.
- The vehicle has been driven at steady highway speeds for a sufficient amount of time.

SET CONDITION

- The PCM uses the (upstream) NOx Sensor 1/1 and the (downstream) NOx Sensor 1/2 feedback to calculate the NOx Conversion Efficiency. The PCM also factors in engine operating and environmental conditions to calculate the DEF dosing rate. The PCM sets this DTC if the NOx Conversion Efficiency is below a calculated threshold target.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OTHER SCR, REDUCTANT, OR NOX DTCS PRESENT
EXHAUST SYSTEM LEAK
DEF CONTAMINATION OR LEAK
DEF SUPPLY LINE RESTRICTION
SCR CATALYST
DEF INJECTOR
DEF SUPPLY PUMP
DAMAGED DIESEL PARTICULATE FILTER (DPF)
NOX SENSORS

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)** .

DIAGNOSTIC TEST

1. CHECK FOR OTHER CATALYST OR NOX DTCS

NOTE: If there are any other Catalyst or NOx related DTCs present, the diagnostics must be completed for those DTCs first before continuing with this one. Any Diagnostics and/or repairs done for Catalyst or NOx related DTCs must be followed by performing the diagnostic procedure for P20EE-00. If this DTC of P20EE-00 set along with P2BA9-00 please perform the diagnostic for P2BA9-00 first followed by P20EE-00.

1. Ignition on, engine not running.
2. Using the scan tool, go to Reports, generate a Vehicle Scan Report, include all information, and send it to the Support Group.
3. Using the scan tool, view DTCs.

Are there any other Catalyst or NOx DTCs present?

Yes

- Perform the Diagnostics for the Catalyst or NOx DTC(s).

No

- Go To [2](#)

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

2. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. CHECK FOR DIESEL EXHAUST FLUID LEAK

1. Turn the ignition on.
2. With the scan tool, erase DTCs.
3. With the scan tool, navigate to Systems Tests and actuate the DEF Injector (Dosing Valve) Actuator Test.

NOTE: This will pressurize the system, making a leak easier to see.

4. Inspect for signs of a Diesel Exhaust Fluid leak at:

- DEF Injector and Injector connectors.
- DEF Pressure Line.
- DEF Supply Pump Assembly.

NOTE: Diesel exhaust fluid will form white deposits around leaky fittings.

Were any leaks found?

Yes

- Repair or replace the faulty component in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE DEF QUALITY

1. Turn the ignition off.
2. Test the quality of the Diesel Exhaust Fluid. Refer to Diesel Exhaust Fluid Emissions, Diagnosis and Testing.

Were there any problems found with the quality of the Diesel Exhaust Fluid?

Yes

- Drain and refill the DEF tank with the correct application Diesel Exhaust Fluid.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK FOR DEPOSITS IN THE DECOMPOSITION TUBE

1. Remove the DEF Injector from the Decomposition Tube.
2. Visually inspect the Decomposition Tube for diesel exhaust fluid deposits.

Were any deposits found?

Yes

- Clean the deposits from the Decomposition Tube.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the Decomposition Tube.

NOTE: Leave the DEF Injector harness connector attached to the DEF Injector.

3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Go To [9](#)

No

- **If above 35 ml:** Replace the DEF Injector in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).
- **If below 26 ml:** Go To [7](#)

7. CHECK THE DEF SUPPLY LINE FOR A RESTRICTION

1. Check the DEF Supply line for a restriction.

Was there a restriction in the DEF Supply line?

Yes

- Replace the DEF Supply line in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .
- Go To

No

- Go To [8](#)

8. DEF SUPPLY PUMP

1. Turn ignition off.
2. Replace the DEF Injector in accordance with the service information. Do not install the DEF Injector back into the Decomposition Tube.

NOTE: At this time, the DEF Volume test must be performed again.

3. With the DEF Injector still removed from the Decomposition Tube place the DEF Injector in a container to capture the fluid sprayed.

NOTE: Connect the DEF Injector harness connector to the DEF Injector.

4. Turn the ignition on.
5. Using the scan tool, begin the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air Bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main Volume Test (a little over one minute), 3-DEF Purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate throughout the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Is the DEF Volume test result still below 26 ml?

Yes

- Replace the DEF Supply Pump in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [9](#)

9. CHECK FOR A DAMAGED DIESEL PARTICULATE FILTER (DPF)

1. Inspect for signs of a damaged DPF by doing the following:
 - Check for signs of heavy soot build-up between the DPF and Selective Catalytic Reduction (SCR)
 - Check for signs of heavy soot build-up on the tail pipe.

- Check for cracks at the DPF outlets using a scope.

Were any issues found?

Yes

- Replace the Diesel Particulate Filter in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To **10**

10. CHECK THE NOX SENSORS

1. Check the NOx Sensors for wiring damage. If any issues are found repair the problem in accordance with the Service Information.
2. Check for an offset/gain on the NOx Sensors.
3. Perform a Service Regeneration using the scan tool. This step will prevent the DPF Regeneration from occurring during testing and clean out the SCR.
4. Perform the following actions and then complete the corresponding repair:

B	Diagnostic Table		B
Task	Question	Repair Action	
1. Drive the vehicle at speeds at or above 55mph and perform multiple long coast downs. During coast downs monitor the NOx Sensors using the scan tool.	Are either of the NOx Sensors showing a value > 20ppm or < -20ppm?	• Yes - Replace that particular NOx Sensor in accordance with the Service Information. • No - Move on to the second row of this table.	
2. Using the scan tool monitor the Exhaust Gas Temperature and NOx Sensors at engine idle until all Exhaust Gas Temperature Sensor readings are close to 150B°C (302B°F).	Is the NOx Sensor 2 value > 40ppm above NOx Sensor 1?	• Yes - Replace the NOx Sensor 2 in accordance with the Service Information. • No - Drive the vehicle at speeds at or above 55mph for 45 minutes.	

NOTE: If either or both NOx Sensor(s) have been replaced the vehicle must be driven at speeds at or above 55mph for 45 minutes to confirm the repair.

Did DTC P20EE return after the road test?

Yes

- Replace the Selective Catalytic Reduction (SCR) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

P20F4-00-REDUCTANT CONSUMPTION TOO LOW

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) consumption by comparing the DEF pressure in the supply line to the known DEF Supply Pump volume. This rationality comparison will detect DEF consumption high or low failures. The PCM will illuminate the MIL light immediately after the diagnostics runs and fails. The DEF injection into the aftertreatment system will be disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- When the DEF system has been unable to successfully prime after a calibrated amount of attempts. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DIESEL EXHAUST FLUID LEVEL
CONTAMINATED DIESEL EXHAUST FLUID
DEF PRESSURE LINE DAMAGED/LEAKING
DEF INJECTOR PHYSICALLY STUCK OPEN
DEF SUPPLY PUMP ASSEMBLY

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any DEF Injector DTCS or DEF Supply/DEF Purge Pump DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF TANK LEVEL AND FLUID

1. Verify the DEF Tank level.
2. Check the fluid for signs of contamination.

Is the fluid level in the DEF Tank above the minimum requirement and free of contamination?

Yes

- Go To [4](#)

No

- Fill the DEF Tank to the proper level with clean Diesel Exhaust Fluid. If the fluid is contaminated, perform the cleaning procedure. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE DEF SUPPLY SYSTEM FOR LEAKS

1. Using the scan tool, begin the DEF Injector Quantity Test
2. During the DEF Injector Quantity Test, visually inspect the DEF Supply Pump Assembly and DEF Pressure Line for signs of a fluid leak.

Are there any leaks in the DEF System?

Yes

- Perform the appropriate repair. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE DEF INJECTOR

1. Stop actuation of the DEF Injector Quantity Test.
2. Turn the ignition off.

3. Remove the DEF Injector and place in a clean container.
4. Turn the ignition on.
5. With the scan tool, navigate to Systems Tests and actuate the DEF Injector Quantity Test.

NOTE: When the DEF Injector (Dosing Valve) Actuator Test is initiated, the DEF Injector is opened. Wait 30 seconds before checking for leaks.

6. Check the DEF Injector for a leak.

Is the DEF Injector leaking?

Yes

- Replace the DEF Injector. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the DEF Supply Pump Assembly in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P20F5-00-REDUCTANT CONSUMPTION TOO HIGH

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) consumption by comparing the DEF pressure in the supply line to the known DEF Supply Pump volume. This rationality comparison will detect DEF consumption high or low failures. The PCM will illuminate the MIL light immediately after the diagnostics runs and fails. The DEF injection into the aftertreatment system will be disabled.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- When the PCM detects that the DEF system pressure has been higher than a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PRESSURE LINE OR FITTINGS RESTRICTED
DEF SUPPLY PUMP ASSEMBLY

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. With the scan tool, navigate to Systems Tests and actuate the DEF Injector (Dosing Valve) Actuator Test.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DEF Injector DTCs or DEF Supply/DEF Purge Pump DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE DEF LINE AND FITTINGS FOR RESTRICTIONS

1. Turn the ignition off.
2. Remove the line from the fitting at the DEF Supply Pump Assembly and DEF Injector and inspect the fittings for signs of crystallization or blockages.

Were any blockages found?

Yes

- Repair or replace the blocked lines or fittings as necessary. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Supply Pump Assembly in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).

Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20FA-00-REDUCTANT PUMP 2 CONTROL CIRCUIT/OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) pressure buildup system to provide correct (overall) performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup is reinitialized.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the DEF Purge Pump Control circuit for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PURGE PUMP CONTROL CIRCUIT OPEN/HIGH RESISTANCE
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND LOAD TEST THE DEF PURGE PUMP (K481) CONTROL CIRCUIT TO CHECK FOR HIGH RESISTANCE

1. The ignition must be off when performing a load test on a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested.
3. Connect the positive lead of the load test tool to the positive side of the Battery (A). **Note:** Refer to the diagram below.
4. Using an approved back probe tool, connect the negative lead of the load test tool to the circuit being tested at the one of the component harness connectors (B).
5. Using an approved back probe tool and a fused jumper wire, connect the circuit being tested to the negative side of the Battery or a known good ground at the other component harness connector (C and D).
6. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit.

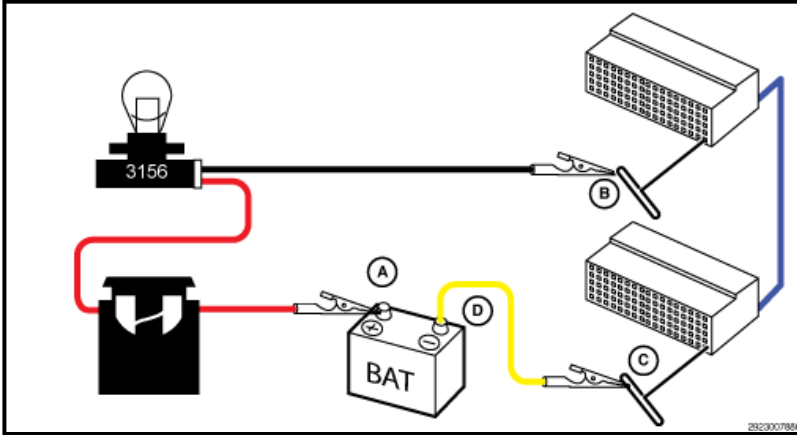
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#) .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to **CIRCUIT LOAD TESTING PROCEDURES**.



WARNING:

To avoid possible serious or fatal injury, **DO NOT** load test any air bag/restraint system components or circuits using the procedures listed here. Refer to the Service Information for proper air bag/restraint system testing procedures.

CAUTION:

Do not load test any circuits with components still connected to the circuit.

NOTE:

When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.

NOTE:

Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the VVV VERIFICATION TEST. Refer to the appropriate verification test.

3. DEF PUMP

1. Replace the DEF Pump in accordance with the Service Information.
2. Reconnect the DEF Pump C1 harness connector.
3. Reconnect the PCM C1 harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.

7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF Pump and the Powertrain Control Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Powertrain Control Module in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20FB-00-REDUCTANT PUMP 2 CONTROL PERFORMANCE

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) pressure buildup system to provide correct (overall) performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup is reinitialized.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The DEF Pump system performs a Pressure Reduction procedure after every driving cycle (In after-run mode). The PCM detects that a comparison of the DEF Pump pressure before and after the Pressure Reduction procedure indicates a difference that is less than a calibrated threshold for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any DTCs P20FA, P20FC, P20FD or toher DEF Supply Pump DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE DEF PUMP SUPPLY/PURGE LINES FOR LEAKS

1. Turn the ignition off.
2. Visually inspect the DEF Pump Supply/Purge lines for leaks.

Are there any leaks present?

Yes

- Repair the DEF Pump Supply/Purge line(s) that are leaking. Then, begin this Diagnostics again starting with the 'DTC IS ACTIVE' Test Step.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. DEF PUMP

1. Replace the DEF Pump in accordance with the Service Information.
2. Ignition on, engine not running.
3. With the scan tool, erase DTCs in the PCM.
4. Start the engine.
5. Allow the engine to reach normal operating temperature.
6. Monitor the scan tool for at least two minutes.
7. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [5](#)

No

- Replacing the DEF Pump repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF Pump and the Powertrain Control Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the Powertrain Control Module in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P20FC-00-REDUCTANT PUMP 2 CONTROL CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) pressure buildup system to provide correct (overall) performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup is reinitialized.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects less than 3.0 Volts on the DEF Supply Pump Control circuit for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PURGE PUMP CONTROL CIRCUIT SHORT TO GROUND
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK THE DEF PURGE PUMP (K481) CONTROL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the DEF Pump C1 harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the DEF Purge Pump (K481) Control circuit at the DEF Pump C1 harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [3](#)

No

- Repair the DEF Purge Pump (K481) Control circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

3. DEF PUMP-LEVEL/TEMP SENSOR

1. Replace the DEF Pump in accordance with the Service Information.
2. Reconnect the DEF Pump C1 harness connector.
3. Reconnect the PCM C1 harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF Pump and the Powertrain Control Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.

4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P20FD-00-REDUCTANT PUMP 2 CONTROL CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Powertrain Control Module (PCM) monitors the Diesel Exhaust Fluid (DEF) pressure buildup system to provide correct (overall) performance. If excessive air is detected during pressure buildup, the Purge Pump system draws fluid back into the DEF tank to remove the air. Once the purge is complete the pressure buildup is reinitialized.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the DEF Supply Pump Control circuit is above a calibrated threshold for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF PURGE PUMP CONTROL CIRCUIT SHORT TO VOLTAGE
DEF PUMP
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE DEF PURGE PUMP (K481) CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the DEF Pump C1 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the DEF Purge Pump (K481) Control circuit at the DEF Pump C1 harness connector.

Is the voltage above 5.2 Volts?

Yes

- Repair the DEF Purge Pump (K481) Control circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. DEF PUMP

1. Turn the ignition off.
2. Replace the DEF Pump in accordance with the Service Information.
3. Reconnect the DEF Pump C1 harness connector.
4. Ignition on, engine not running.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Monitor the scan tool for at least two minutes.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF Pump and the Powertrain Control Module.
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Powertrain Control Module in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2122-00-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Accelerator Pedal Position (APP) Sensor contains two independent three wire inductive sensors. Each sensor provides independent pedal position signals to the Powertrain Control Module (PCM). The raw voltage signal from APP 1 Sensor is 2 times the raw voltage signal from APP 2 Sensor. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The APP Sensor No. 1 Signal circuit is below the calibrated threshold for 0.31 second.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
APP SENSOR NO. 1 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR NO. 1 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
APP SENSOR NO. 1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO GROUND
APP SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR NO. 1 SENSOR GROUND CIRCUIT
APP SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR NO. 2 SENSOR GROUND CIRCUIT
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: The APP Sensor No. 2 signal should always be approximately 1/2 the voltage of the APP Sensor No. 1 signal.

1. Refer to the recorded DTCs.

Are there any Sensor Reference DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE APP SENSOR NO. 1 (K23) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the APP Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between ground and the APP Sensor No. 1 (K23) Signal circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the APP Sensor No. 1 (K23) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK FOR THE APP SENSOR NO. 1 (K23) SIGNAL CIRCUIT FOR A SHORT TO THE SENSOR GROUND CIRCUITS

1. Measure the resistance between the APP Sensor No. 1 (K23) Signal circuit and the APP Sensor No. 1 (K167) Sensor Ground circuit at the APP Sensor harness connector.
2. Measure the resistance between the APP Sensor No. 1 (K23) Signal circuit and the APP Sensor No. 2 (K400) Sensor Ground circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [5](#)

No

- Repair the short to the circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE APP SENSOR NO. 1 (K23) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the APP Sensor No. 1 (K23) Signal circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the APP Sensor No. 1 (K23) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect the APP Sensor harness connector.

2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the APP Sensor harness connector.
7. Connect a jumper between the 5-Volt Supply circuit and the APP Sensor No. 1 (K23) Signal circuit at the APP Sensor harness connector.
8. Turn the ignition on.
9. With the scan tool, select View DTCs.

NOTE: The scan tool should display an Accelerator Pedal Position Sensor No. 1 High DTC as active with the jumper in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. POWERTRAIN CONTROL MODULE

1. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Accelerator Pedal Position Sensor and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Perform any Technical Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace and program the Powertrain Control Module in accordance the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2123-00-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH

For a complete THROTTLE CONTROL SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Accelerator Pedal Position (APP) Sensor contains two independent three wire inductive sensors. Each sensor provides independent pedal position signals to the Powertrain Control Module (PCM). The raw voltage

signal from APP 1 Sensor is 2 times the raw voltage signal from APP 2 Sensor. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The APP Sensor No. 1 signal circuit is above the calibrated threshold for 0.31 seconds.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
APP SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
APP SENSOR 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
APP SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 1 5-VOLT SUPPLY CIRCUIT
APP SENSOR 1 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 2 5-VOLT SUPPLY CIRCUIT
APP SENSOR 1 SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ACCELERATOR PEDAL POSITION (APP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Sensor Reference DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE APP SENSOR 1 (K23) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Turn the ignition off.
2. Disconnect the APP Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Remove the ASD Relay from the Power Distribution Center (PDC).
5. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
6. Turn the ignition on.
7. Measure the voltage of the APP Sensor 1 (K23) Signal circuit at the APP Sensor harness connector.

Is there any voltage present?

Yes

- Repair the APP Sensor 1 (K23) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE APP SENSOR 1 (K23) SIGNAL CIRCUIT FOR A SHORT TO THE 5-VOLT SUPPLY CIRCUITS

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Measure the resistance between the APP Sensor 1 (K23) Signal circuit and the (K855) 5-Volt Supply circuit at the APP Sensor harness connector.
4. Measure the resistance between the APP Sensor 1 (K23) Signal circuit and the (K856) 5-Volt Supply circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms between the APP Sensor 1 (K23) Signal circuit and both 5-Volt Supply circuits?

Yes

- Go To [5](#)

No

- Repair the APP Sensor 1 (K23) Signal circuit for a short to the circuit that measured below 10k ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE (K167) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K167) Sensor Ground circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (K167) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect the APP Sensor harness connector.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the APP Sensor harness connector.
7. Connect a jumper wire between the (K167) Sensor Ground circuit and the APP Sensor 1 (K23) Signal circuit at the APP Sensor harness connector.
8. Turn the ignition on.
9. With the scan tool, select View DTCs.

NOTE: The scan tool should display an Accelerator Pedal Position Sensor 1 Low DTC as active with the jumper wire in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2127-00-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Accelerator Pedal Position (APP) Sensor contains two independent three wire inductive sensors. Each sensor provides independent pedal position signals to the Powertrain Control Module (PCM). The raw voltage signal from APP 1 Sensor is 2 times the raw voltage signal from APP 2 Sensor. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The APP Sensor 2 Signal circuit is below the calibrated threshold for 0.31 second.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
APP SENSOR 2 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 2 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
APP SENSOR 2 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO GROUND
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 2 SENSOR GROUND CIRCUIT
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 1 SENSOR GROUND CIRCUIT
ACCELERATOR PEDAL POSITION (APP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any Sensor Reference DTCS present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE (K852) 5-VOLT SUPPLY CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the APP Sensor harness connector.
3. Turn the ignition on.
4. Measure the voltage of the (K852) 5-Volt Supply circuit at the APP Sensor harness connector.

Is the voltage reading above 4.8 volts?

Yes

- Go To [4](#)

No

- Repair the (K852) 5-Volt Supply circuit for an open circuit or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between ground and the APP Sensor 2 (K29) Signal circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the APP Sensor 2 (K29) Signal circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR A SHORT TO THE SENSOR GROUND CIRCUITS

1. Measure the resistance between the APP Sensor 2 (K29) Signal circuit and the (K400) Sensor Ground circuit at the APP Sensor harness connector.
2. Measure the resistance between the APP Sensor 2 (K29) Signal circuit and the (K167) Sensor Ground circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms between the APP Sensor 2 (K29) Signal circuit and both Sensor Ground circuits?

Yes

- Go To [6](#)

No

- Repair the Accelerator Pedal Position Sensor 2 (K29) Signal circuit for a short to the circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the APP Sensor 2 (K29) Signal circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the APP Sensor 2 (K29) Signal circuit for an open or high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect the APP Sensor harness connector.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the APP Sensor harness connector.
7. Connect a jumper between the (K852) 5-Volt Supply circuit and the APP Sensor 2 (K29) Signal circuit at the APP Sensor harness connector.
8. Turn the ignition on.
9. With the scan tool, view DTCs.

NOTE: The scan tool should display a P2128-Accelerator Pedal Position Sensor 2 High DTC as active or pending with the jumper in place.

Does the scan tool display the DTC as described above?

Yes

- Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2128-00-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The Accelerator Pedal Position (APP) Sensor contains two independent three wire inductive sensors. Each sensor provides independent pedal position signals to the Powertrain Control Module (PCM). The raw voltage signal from APP 1 Sensor is 2 times the raw voltage signal from APP 2 Sensor. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The APP Sensor 2 signal circuit is above the calibrated threshold for 0.31 second.

DEFAULT ACTION

- ETC light will flash.

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
APP SENSOR 2 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 2 5-VOLT SUPPLY CIRCUIT
APP SENSOR 2 SIGNAL CIRCUIT SHORTED TO THE APP SENSOR 1 5-VOLT SUPPLY CIRCUIT
APP SENSOR 2 SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
ACCELERATOR PEDAL POSITION (APP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any Sensor Reference or Sensor Supply voltage DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

1. Disconnect the PCM C1 harness connector.

2. Remove the ASD Relay from the Power Distribution Center (PDC).
3. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector.
4. Turn the ignition on.
5. Measure the voltage of the APP Sensor 2 (K29) Signal circuit in the APP Sensor harness connector.

Is there voltage present on any of the circuits?

Yes

- Repair the APP Sensor 2 (K29) Signal circuit for a short to voltage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR A SHORT TO THE 5-VOLT SUPPLY CIRCUITS

1. Turn the ignition off.
2. Remove the jumper wire and install the ASD Relay.
3. Measure the resistance between the APP Sensor 2 (K29) Signal circuit and the (K856) 5-Volt Supply circuit at the APP Sensor harness connector.
4. Measure the resistance between the APP Sensor 2 (K29) Signal circuit and the (K855) 5-Volt Supply circuit at the APP Sensor harness connector.

Is the resistance above 10k Ohms between the APP Sensor 2 (K29) Signal circuit and 5-Volt Supply circuits?

Yes

- Go To [5](#)

No

- Repair the APP Sensor 2 (K29) Signal circuit for a short to the circuit that measured below 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

5. CHECK THE APP SENSOR 2 (K29) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the APP Sensor 2 (K29) Signal circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the APP Sensor 2 (K29) Signal circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect the APP Sensor harness connector.

2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Turn the ignition off.
6. Disconnect the APP Sensor harness connector.
7. Connect a jumper wire between the (K400) Sensor Ground circuit and the APP Sensor 2 (K29) Signal circuit at the APP Sensor harness connector.
8. Turn the ignition on.
9. With the scan tool, select View DTCs.

NOTE: **The scan tool should display an Accelerator Pedal Position Sensor 2 Low DTC as active with the jumper wire in place.**

Does the scan tool display the DTC as described above?

Yes

- Replace the Accelerator Pedal Position Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [7](#)

7. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.

10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2138-00-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Accelerator Pedal Position (APP) Sensor contains two independent three wire inductive sensors. Each sensor provides independent pedal position signals to the Powertrain Control Module (PCM). The raw voltage signal from APP No. 1 Sensor is two times the raw voltage signal from APP No. 2 Sensor. Although the raw voltage signals differ, the scan tool converts and displays these voltages as matching percentages of pedal travel.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the correlation between APP Sensor 1 and APP Sensor 2 is not plausible. Idle may be affected when the brake pedal is pressed or if a brake switch circuit error is present. Acceleration rate and engine output are limited. The PCM will set this DTC when the correlation failure is present for over 0.4 seconds. This is a one Trip Fault.

DEFAULT ACTION

- ETC light will flash.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
APP SENSOR 1 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 1 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 1 SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 2 5-VOLT SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 2 SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
APP SENSOR 2 SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
ACCELERATOR PEDAL POSITION (APP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any 5-Volt Reference or APP Sensor circuit DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE (K852) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the APP Sensor harness connector.

NOTE:

Check the connector for proper connection to the sensor and carefully inspect for pushed out, corroded or damaged terminals in the connector before performing any electrical checks or replacing any components.

3. Disconnect the PCM C1 harness connector.

4. Measure the resistance of the (K852) 5-Volt Supply circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (K852) 5-Volt Supply circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE APP SENSOR 1 (K29) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the APP Sensor 1 (K29) Signal circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the APP Sensor 1 (K29) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (K167) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K167) Ground circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [6](#)

No

- Repair the (K167) Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE (K854) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K854) 5-Volt Supply circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (K8547) 5-Volt Supply circuit for an open/high resistance.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE APP SENSOR 2 (K23) SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the APP Sensor 2 (K23) Signal circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Repair the APP Sensor 2 (K23) Signal circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (K400) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (K400) Sensor Ground circuit between the APP Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Repair the (K400) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK THE APP SENSOR FOR PROPER OPERATION

1. Replace the APP SENSOR in accordance with the Service Information.
2. Connect the APP Sensor connector and PCM harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the recorded [Freeze Frame / Environmental Data] and the When Monitored conditions, operate the vehicle in the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [10](#)

No

- Replacing the APP Sensor repaired the condition.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

10. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).

3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P214F-00-REDUCTANT HEATER 1 CURRENT TOO HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Aftertreatment system active.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Diesel Exhaust Fluid (DEF) Tank or Line heater supply circuit is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
DEF TANK HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION**.

2. ISOLATE AND CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Diesel Exhaust Fluid (DEF) Heater Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2195-00-O2 SENSOR 1/1 STUCK LEAN

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1, 000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the O2 Sensor correction offset is too high.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM FAILURE
INTAKE AIR SYSTEM LEAK
EGR SYSTEM FAILURE
EXHAUST SYSTEM LEAK
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
 1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.

3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. CHECK FOR OTHER DTCs

1. Refer to the recorded DTCs.

Are there any O2 Sensor, cylinder misfire, Crank Sensor, MAF Sensor, EGR, Fuel Pressure or Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#).

No

- Go To [3](#)

3. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to [CHECKING THE FUEL DELIVERY SYSTEM](#).

Were any fuel system problems found?

Yes

- Perform the appropriate repairs to the fuel system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE INTAKE AIR SYSTEM FOR RESTRICTIONS

1. Check the Intake Air System for any signs of a restriction.

Were any Intake Air System restrictions found?

Yes

- Perform the appropriate repair to the Intake Air System.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#) .

Is there evidence of a leak?

Yes

- Perform the appropriate repair as indicated.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE EXHAUST SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the Exhaust System for any signs of a leak or restriction.

Were any Exhaust System problems found?

Yes

- Perform the appropriate repairs to the Exhaust System.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE EGR SYSTEM FOR LEAKS AND PERFORM THE EGR ACTUATION TESTING PROCEDURE

1. Look for visible signs (soot streaks) of an external EGR leak.
2. With the scan tool, perform the EGR Actuation/Testing procedure.

Were any problems found with the EGR system?

Yes

- Perform the appropriate repairs to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Oxygen Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, navigate to Actuator Tests and perform the O2 Sensor Replaced procedure.

5. Start the engine.
6. Allow the engine to reach normal operating temperature.
7. Monitor the scan tool for at least five minutes.
8. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [9](#)

No

- Replacing the Oxygen Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2196-00-O2 SENSOR 1/1 STUCK RICH

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new. The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the O2 Sensor correction offset is too low.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUEL DELIVERY SYSTEM FAILURE
INTAKE AIR SYSTEM LEAK
EGR SYSTEM FAILURE
EXHAUST SYSTEM LEAK
OXYGEN SENSOR

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any O2 Sensor, cylinder misfire, Crank Sensor, MAF Sensor, EGR, Fuel Pressure or Fuel Injector DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE FUEL DELIVERY SYSTEM

1. Perform the CHECKING THE FUEL DELIVERY SYSTEM diagnostic procedure. Refer to **CHECKING THE FUEL DELIVERY SYSTEM** .

Were any fuel system problems found?

Yes

- Perform the appropriate repairs to the fuel system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE INTAKE AIR SYSTEM FOR RESTRICTIONS

1. Check the Intake Air System for any signs of a restriction.

Were any Intake Air System restrictions found?

Yes

- Perform the appropriate repair to the Intake Air System.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE INTAKE AIR SYSTEM FOR LEAKS

1. Perform the Engine Diagnosis and Testing INTAKE AIR SYSTEM LEAK DETECTION test procedure. Refer to [INTAKE AIR SYSTEM LEAK DETECTION](#) .

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Is there evidence of a leak?

Yes

- Perform the appropriate repair as indicated.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE EXHAUST SYSTEM FOR LEAKS OR RESTRICTIONS

1. Check the Exhaust System for any signs of a leak or restriction.

Were any Exhaust System problems found?

Yes

- Perform the appropriate repairs to the Exhaust System.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE EGR SYSTEM FOR LEAKS AND PERFORM THE EGR ACTUATION TESTING PROCEDURE

1. Look for visible signs (soot streaks) of an external EGR leak.
2. With the scan tool, perform the EGR Actuation/Testing procedure.

Were any problems found with the EGR system?

Yes

- Perform the appropriate repairs to the EGR system.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new Oxygen Sensor in accordance with the Service Information.
3. Turn the ignition on.
4. With the scan tool, navigate to Actuator Tests and perform the O2 Sensor Replaced procedure.
5. Start the engine.
6. Allow the engine to reach normal operating temperature.
7. Monitor the scan tool for at least five minutes.
8. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [9](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2199-00-INTAKE AIR TEMPERATURE SENSOR 1 / 2 CORRELATION

For a complete INTAKE AIR SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mass Air Flow (MAF)/Intake Air Sensor is a multi-function device that monitors several conditions related to Air Intake. Along with Mass Air Flow, this 8-pin Sensor also checks Intake Air Temperature, Humidity, and Inlet Air Pressure. The MAF/Intake Air Sensor reports these conditions back to the Powertrain Control Module (PCM). The Intake Air Temperature (IAT) Sensor 1 is located inside the MAF/Intake Air Sensor. The Intake Air Temperature (IAT) sensor 2 is also located inside the MAF/Intake Air Sensor, but it is part of the humidity sensing device. The IAT 2 signal circuit is named: 'Humidity Signal'. The humidity sensing device sends a Pulse-Width Modulated (PWM) signal to the PCM. The IAT Sensor 2 is used solely for the calculation of relative humidity and is otherwise unused by the system. A correlation test is performed between these two sensors. The PCM illuminates the Malfunction Indicator Lamp (MIL) immediately when the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The PCM detects the absolute value of the difference between the IAT Sensor 1 and the IAT Sensor 2 is greater than a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
MASS AIR FLOW/INTAKE AIR SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are any of the DTCs P0096, P009A, P00F3, P00F4, P00F5, P0111, P0112, or P0113 present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK THE ABILITY OF THE PCM TO READ THE MAF/INTAKE AIR SENSOR SIGNALS

1. Turn the ignition off.
2. Disconnect the MAF/Intake Air Sensor harness connector.
3. Turn the ignition on.
4. While monitoring the scan tool, connect a jumper between the (K757) Sensor Ground circuit and the Humidity (K648) Signal circuit at the MAF/Intake Air Sensor harness connector.

Did the P00F4 DTC set?

Yes

- Replace the MAF/Intake Air Sensor in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P21C5-00-REDUCTANT LEVEL SENSOR 1 STUCK

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Tank Level Sensor and Diesel Exhaust Fluid (DEF) Tank Temperature Sensor are combined in one circuit to measure the level and temperature of the fluid inside the DEF Tank. This circuit is used to transmit a multiplexed PWM signal from the DEF Tank to the Powertrain Control Module (PCM). This one circuit carries three pieces of information: The DEF Tank level (Measured by using an ultrasonic transducer reporting ultrasound waves reflected/echoed by the fluid surface), the DEF temperature, and the DEF Level/Temperature Sensor status.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- With the Selective Catalytic Reduction (SCR) system activated.

SET CONDITION

- The PCM compares the DEF tank level actual height differences during acceleration (sloshing) to a calculated level. If the comparison is less than or equal to a calibrated threshold for a calibrated amount of time, the PCM will set this DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

NOTE: Before beginning this Diagnostic Tree, an inspection of the DEF Tank is required to verify the following conditions:

- The fluid level in the DEF Tank must be greater than 1/4 full.
 - The DEF Tank must not be filled all the way to the top (slight air pocket present).
 - The temperature of the fluid in the DEF Tank must be greater than 0B°C (32B°F).
1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
 2. For future reference, run and save a vehicle Scan Report and all related recorded data.
 3. With the scan tool, erase all DTCs.
 4. Perform several ignition cycles turning the ignition off for at least 60 seconds between each cycle.
 5. Start the engine and allow to reach operating temperature.
 6. Test drive the vehicle under normal operating conditions for a minimum of 10 km (6.2 mi.) on roads with less than a 4% grade.
 7. Turn the ignition off for a minimum of 75.0 seconds.
 8. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are there any DEF Level circuit Low or High DTCS or DEF Heater-related DTCS Active or Pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. VISUALLY INSPECT FOR ICE FORMATION IN THE DEF TANK

NOTE: Ice forming on the inside of the DEF Tank can set this DTC.

1. Remove the filler tube to the DEF Tank and visually inspect for the presence of ice crystals forming.

Are there ice crystals forming within the DEF system?

Yes

- Allow the vehicle to remain inside the repair facility long enough for the ice within the DEF System to dissolve. Then, return to Test Step **1. CHECK FOR AN ACTIVE DTC** .

If the DTC does not return, perform the POWERTRAIN VERIFICATION TEST. If the DTC does return, continue this Diagnostic Procedure from the beginning.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. INSTALL A NEW DEF LEVEL/TEMPERATURE SENSOR ASSEMBLY (ENTIRE DEF TANK) AND RETEST FOR DTC

1. Turn the ignition off.
2. Install a new DEF Level/Temperature Sensor Assembly in accordance with the Service Information. (Must replace entire DEF Tank).
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCS.
5. Start the engine and allow to reach operating temperature.
6. Test drive the vehicle during normal operating conditions.
7. With the scan tool, read PCM DTCS.

Does the scan tool display this DTC?

Yes

- Go To [5](#)

No

- Test complete. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired. If P241D was also present, it will be necessary to reset the SCR Timer: Using the scan tool, navigate to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P21C7-00-REDUCTANT CONTROL MODULE POWER RELAY-RELAYS CONTROL CIRCUIT-OPEN

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- With the engine running.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Selective Catalyst Reduction (SCR) Relay Control circuit is open.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
OPEN FUSE(S) IN THE POWER DISTRIBUTION CENTER (PDC)
SCR RELAY CONTROL CIRCUIT OPEN/HIGH RESISTANCE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OPEN FUSES IN THE POWER DISTRIBUTION CENTER (PDC)

1. Check all fuses in the PDC. If a fuse is found to be open, replace the fuse and retest.

Are there any open fuses in the PDC?

Yes

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE SCR (K401) RELAY CONTROL 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. REPLACE THE POWER DISTRIBUTION CENTER (PDC) AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the PDC in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 75.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty PDC repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P21DD-00-REDUCTANT HEATER 1 CURRENT TOO LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Aftertreatment system active.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Diesel Exhaust Fluid (DEF) Tank or Line heater supply circuit is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORTED TO GROUND
DEF TANK HEATER SUPPLY CIRCUIT SHORTED TO GROUND
DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. REPLACE THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.

3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Diesel Exhaust Fluid (DEF) Heater Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2200-00-NOX SENSOR 1 CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 5.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on, run the engine to operating temperature
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are the P220A, P220B, U029D, or U029E DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. INSPECT THE DIESEL EXHAUST FLUID

1. Check for evidence of contamination or degraded fluid.

Is there is evidence of contamination or degraded fluid?

Yes

- Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure. Refer to [DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE NOX SENSOR 1/1 WIRING HARNESS AND CONNECTOR

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the NOx Sensor 1/1 (Module) and the Powertrain Control Module (PCM).
2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.

6. Perform any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Replace the NOx Sensor 1/1 in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

P2201-00-NOX SENSOR 1 CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx Sensor reports an internal wiring failure to the PCM. If the PCM detects that the failure is present for 5.0 seconds, it will illuminate the Malfunction Illumination Lamp (MIL) and set the DTC. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on, run the engine to operating temperature
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

NOTE: During extremely cold ambient temperatures, it may be necessary to perform an overnight soak of the vehicle at shop temperatures before beginning this Test Step.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Are the P220A, P220B, U029D, or U029E DTCS active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#) .

No

- Go To [**4**](#)

4. INSPECT THE DIESEL EXHAUST FLUID

1. Check for evidence of contamination or degraded fluid.

Is there is evidence of contamination or degraded fluid?

Yes

- Perform the Diagnostic and Testing - Diesel Exhaust Fluid procedure. Refer to [**DIESEL EXHAUST FLUID EMISSIONS \[EXJ\], DIAGNOSIS AND TESTING**](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**5**](#)

5. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [**6**](#)

6. CHECK THE NOx SENSOR 1/1 WIRING HARNESS AND CONNECTOR

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Using the appropriate wiring diagram/schematic as a guide, inspect the (vehicle harness) wiring and connectors between the NOx Sensor 1/1 (Module) and the Powertrain Control Module (PCM).

2. Look for any chafed, pierced, pinched, or partially broken wires.
3. Look for broken, bent, pushed out or corroded terminals.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change or for the DTC to reset during the wiggle test.
6. Perform any Service Bulletins that may apply.

Were any problems found?

Yes

- Repair as necessary. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Replace the NOx Sensor 1/1 in accordance with the Service Information. Reset the SCR Timer: Using the scan tool, go to Misc. Functions>SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P2202-00-NOX SENSOR 1 CIRCUIT LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With engine running.

SET CONDITION

- The NOx Sensor 1/1 detects that the voltage supplied is below its calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
NOX SENSOR 1/1

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the Fused Ignition (F204) Output circuit for an open or short to ground, or repair the Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE NOX SENSOR FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. INSTALL A NEW NOx SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [7](#)

No

- Replacing the NOx Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2203-00-NOX SENSOR 1 CIRCUIT HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With engine running

SET CONDITION

- The NOx Sensor 1/1 detects that the voltage supplied is above it's calibrated limits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GROUND CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
NOX SENSOR 1/1

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other after treatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [5](#)

No

- Repair the (Z908) Sensor Ground circuit for a short to voltage or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE NOX SENSOR FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. INSTALL A NEW NOx SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [7](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2209-00-NOX SENSOR 1 HEATER SENSE CIRCUIT PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/1 heater resistance is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/1 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
5. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
6. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
7. Repeat this condition three to five times.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any NOx Sensor circuit, Fuel Injector, EGR, Turbocharger or DEF System DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. PERFORM AN INJECTOR KILL TEST AND CHECK FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. CHECK FOR EXCESSIVE ENGINE OIL BEING INTRODUCED INTO THE AFTERTREATMENT SYSTEM

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the aftertreatment system from the engine.

Was engine oil, fuel or moisture found in the Turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [6](#)

6. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.
3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P220A-00-NOX SENSOR BANK 1 SENSOR 1 SUPPLY VOLTAGE CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx sensor 1/1 reports to the PCM that the Supply Voltage is above or below a calibrated voltage threshold for 4.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
HIGH BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
SCR 2 RELAY
NOX SENSOR 1/1
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. INSTALL A NEW SCR RELAY 2 AND RETEST FOR DTC

1. Turn the ignition off.
2. Replace the SCR Relay 2 (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Start and run the engine for 10 seconds.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the SCR Relay 2.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE SUPPLY VOLTAGE TO THE NOX SENSOR

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION:

Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [9](#)

No

- Go To [6](#)

6. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z908) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [7](#)

7. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) C3 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Fused Ignition (F204) Output circuit at the terminal on the PDC side of the harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Repair the Fused Ignition (F204) Output circuit between the NOx Sensor 1/1 and the PDC for a short to ground or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE POWER DISTRIBUTION CENTER (PDC) FOR AN OPEN

1. Turn the ignition off.
2. Remove the SCR Relay 2.
3. Turn the ignition on.
4. Measure the resistance between ground and the SCR Relay 2 (K402) Control circuit at the SCR Relay 2 terminal.

Is the resistance above 3.0 Ohms?

Yes

- Repair the SCR Relay 2 (K402) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. INSTALL A NEW NOX SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P220B-00-NOX SENSOR BANK 1 SENSOR 2 SUPPLY VOLTAGE CIRCUIT

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The NOx sensor 1/2 reports to the PCM that the Supply Voltage is above or below a calibrated voltage threshold for 4.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
HIGH BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT SHORT TO GROUND
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
SCR 2 RELAY
NOX SENSOR 1/2
POWER DISTRIBUTION CENTER (PDC)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.

5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. VERIFY THE CORRECT APPLICATION AND LOCATION OF THE NOX SENSORS

1. Verify that the correct application NOx Sensors are being used and properly connected in their correct locations.

Are the NOx Sensors configured correctly?

Yes

- Go To [3](#)

No

- Install the correct NOx Sensors in the correct locations.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. INSTALL A NEW SCR RELAY 2 AND RETEST FOR DTC

1. Turn the ignition off.
2. Replace the SCR Relay 2 (in the Power Distribution Center) with a known good relay.
3. Turn the ignition on.
4. With the scan tool, erase DTCs in the PCM.
5. Start and run the engine for 10 seconds.
6. With the scan tool, select View DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the SCR Relay 2.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK THE SUPPLY VOLTAGE TO THE NOX SENSOR

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z909) Sensor Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Go To [9](#)

No

- Go To [6](#)

6. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Measure the resistance between ground and the (Z909) Sensor Ground circuit at the NOx Sensor 1/2 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the (Z909) Sensor Ground circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Power Distribution Center (PDC) C3 harness connector.
3. Turn the ignition on.
4. Measure the voltage on the Fused Ignition (F204) Output circuit at the terminal on the PDC side of the harness connector.

Does the voltage read between 10.7-16.0 volts?

Yes

- Repair the Fused Ignition (F204) Output circuit between the NOx Sensor 1/2 and the PDC for a short to ground or an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE POWER DISTRIBUTION CENTER FOR AN OPEN CIRCUIT

1. Turn the ignition off.
2. Remove the SCR Relay 2.
3. Turn the ignition on.
4. Measure the resistance between ground and the) SCR Relay 2 (K402 Control circuit at the SCR Relay 2 terminal.

Is the resistance above 3.0 Ohms?

Yes

- Repair the SCR Relay 2 (K402) Control circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Power Distribution Center (PDC) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION:

Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. INSTALL A NEW NOX SENSOR 1/2 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.

10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P220E-00-NOX SENSOR HEATER 1/1 CONTROL CIRCUIT RANGE/PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM determines that the NOx sensor doesn't achieve a calibrated temperature during initial warm up or the NOx Sensor does not maintain a calibrated temperature after warm up. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/1

Possible Causes
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the Fused Ignition (F204) Output circuit for an open or short to ground, or check the Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE NOX SENSOR FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/1 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. INSTALL A NEW NOx SENSOR 1/1 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/1 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [8](#)

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

P220F-00-NOX SENSOR HEATER 1/2 CONTROL CIRCUIT RANGE/PERFORMANCE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the engine running.

SET CONDITION

- The PCM determines that the NOx sensor doesn't achieve a calibrated temperature during initial warm up or the NOx Sensor does not maintain a calibrated temperature after warm up. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1/2
INCORRECT NOX SENSOR APPLICATION OR INCORRECT CONNECTION
EXHAUST LEAK
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other aftertreatment DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [**3.0L DIESEL - DIAGNOSTIC CODE INDEX**](#).

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER OPERATION

1. Ensure that the Batteries and charging system are operating correctly and providing the proper system voltage.

Were any issues found with the Batteries or charging system?

Yes

- Perform the appropriate repairs.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [4](#)

4. CHECK THE EXHAUST SYSTEM FOR LEAKS

1. Visually inspect the entire exhaust system for signs of a leak.

Were any exhaust leaks found?

Yes

- Perform the appropriate repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [5](#)

5. CHECK THE FUSED IGNITION (F204) OUTPUT CIRCUIT AND THE (Z908) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition (F204) Output circuit and the (Z908) Sensor Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the Fused Ignition (F204) Output circuit for an open or short to ground, or check the (Z908) Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE NOX SENSOR FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.

CAUTION:

Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the NOx Sensor 1/2 and the Powertrain Control Module (PCM).
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. INSTALL A NEW NOX SENSOR 1/2 AND RETEST FOR DTC

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION:

Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Install a new NOx Sensor 1/2 in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE:

During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [8](#)

No

- Replacing NOx Sensor 1/2 repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P221C-00-REDUCTANT HEATER B CURRENT TOO LOW

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Aftertreatment system active.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Diesel Exhaust Fluid (DEF) Tank or Line heater supply circuit is below a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORTED TO GROUND DEF TANK HEATER SUPPLY CIRCUIT SHORTED TO GROUND DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ISOLATE AND CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as

a guide to follow the path of the circuit.

3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [3](#)

3. ISOLATE AND CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [4](#)

4. REPLACE THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.

8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Diesel Exhaust Fluid (DEF) Heater Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P221D-00-REDUCTANT HEATER B CURRENT TOO HIGH

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Aftertreatment system active.

SET CONDITION

- The Powertrain Control Module (PCM) detects that Diesel Exhaust Fluid (DEF) Tank or Line heater supply circuit is above a calibrated threshold.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF LINE HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
DEF TANK HEATER SUPPLY CIRCUIT SHORTED TO VOLTAGE
DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS - ERASE DTCS AND CHECK FOR DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Is the DTC Active or Pending?

Yes

- Go To [2](#)

No

- Perform the appropriate INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#).

2. ISOLATE AND CHECK THE DEF LINE HEATER (K404) SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [3](#)

3. ISOLATE AND CHECK THE DEF TANK HEATER (K403) SUPPLY CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE PCM HARNESS CONNECTOR

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. At this time leave all in-line connectors connected. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **With the circuit isolated there should be no continuity between the circuit being tested and any other circuit.**

Is there continuity between the circuit being tested and any other circuit?

Yes

- Repair the short between the circuits that have continuity. Use the appropriate wiring diagram as a guide to trace the circuits and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. REPLACE THE DIESEL EXHAUST FLUID (DEF) HEATER CONTROL MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the component in accordance with the Service Information.
3. Connect the component and Electronic Control Unit (ECU) harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the faulty Diesel Exhaust Fluid (DEF) Heater Control Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.

9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P2227-00-BAROMETRIC PRESSURE CIRCUIT PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects Barometric Pressure Sensor circuit is below a calibrated threshold for 0.8 second. The Barometric Pressure Sensor is located internal to the PCM.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.

- Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
- With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P2228-00-BAROMETRIC PRESSURE SENSOR CIRCUIT LOW

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects Barometric Pressure Sensor circuit is below a calibrated threshold for 0.8 second. The Barometric Pressure Sensor is located internal to the PCM.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

- With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
- For future reference, run and save a vehicle Scan Report and all related recorded data.
- With the scan tool, erase all DTCs.
- Turn the ignition off for a minimum of 75.0 seconds.
- Turn the ignition on.
- Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
- With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P2229-00-BAROMETRIC PRESSURE SENSOR CIRCUIT HIGH

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the Barometric Pressure Sensor circuit voltage is above a calibrated threshold for 0.8 second. The Barometric Pressure Sensor is located internal to the PCM.

DEFAULT ACTION

- ETC light will illuminate.
- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

P2237-00-O2 SENSOR 1/1 PUMP CELL CURRENT CIRCUIT OPEN

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the O2 Sensor 1/1 at operating temperature.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the O2 Sensor 1/1 Positive Current Control circuit for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 SENSOR 1/1 NEGATIVE CURRENT CONTROL CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE O2 SENSOR 1/1 CURRENT (K89) CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the O2 Sensor 1/1 Current (K89) Control circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the O2 Sensor 1/1 Current (K89) Control circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Install a new Oxygen Sensor in accordance with the Service Information.
4. Turn the ignition on.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Test drive the vehicle and monitor the scan tool.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P2243-00-O2 SENSOR 1/1 REFERENCE VOLTAGE CIRCUIT/OPEN

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on and the O2 Sensor 1/1 at operating temperature.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the O2 Sensor 1/1 Ground circuit for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
O2 SENSOR 1/1 GROUND CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **[INTERMITTENT DTC](#)**.

2. CHECK THE (F343) FUSED IGNITION OUTPUT CIRCUIT VOLTAGE

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.
3. Turn the ignition on.
4. Using a 12-volt test light, probe the (F343) Fused Ignition Output circuit at the Oxygen Sensor harness connector.

Is the Test light illuminated and bright?

Yes

- Go To [3](#)

No

- Repair the (F343) Fused Ignition Output circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **[PCM VERIFICATION TEST](#)**.

3. CHECK THE (K902) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.

3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the (K902) Sensor Ground circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [4](#)

No

- Repair the (K902) Sensor Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Install a new Oxygen Sensor in accordance with the Service Information.
4. Turn the ignition on.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Test drive the vehicle and monitor the scan tool.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [5](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

P224A-00-NOX SENSOR HEATER RESISTANCE (BANK 1 SENSOR 1)

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/1 heater resistance is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/1 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any NOx Sensor circuit, Fuel Injector, EGR, Turbocharger or DEF System DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. PERFORM AN INJECTOR KILL TEST AND CHECK FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR EXCESSIVE ENGINE OIL BEING INTRODUCED INTO THE AFTERTREATMENT SYSTEM

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the aftertreatment system from the engine.

Was engine oil, fuel or moisture found in the Turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE DEF VOLUME FROM THE INJECTOR

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.

3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, navigate to the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/1 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

P224B-00-NOX SENSOR HEATER RESISTANCE (BANK 1 SENSOR 2)

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module detects that the NOx Sensor 1/2 heater resistance is above or below a calibrated threshold for a calibrated amount of time.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
ENGINE MISFIRE
EXCESSIVE FUEL OR OIL INTRODUCED INTO THE EXHAUST SYSTEM
FAULTY DEF INJECTOR
DIESEL EXHAUST FLUID CRYSTALLIZATION OR DEPOSITS
NOx SENSOR 1/2 DRIFTED OUT OF RANGE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Start the engine, monitor Exhaust Gas Temperature Sensor 3 until it reaches 150B°C (302B°F).
6. Drive the vehicle at 50 MPH, ensure that it is not in DPF Regeneration mode.
7. Perform a zero fueling event (decel condition for 10 seconds, with foot off of accelerator pedal).
8. Repeat this condition three to five times.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any NOx Sensor circuit, Fuel Injector, EGR, Turbocharger or DEF System DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX**.

No

- Go To [3](#)

3. PERFORM AN INJECTOR KILL TEST AND CHECK FOR CYLINDER MISFIRE

1. Start the engine.
2. With the scan tool, navigate to Systems Tests, and perform the Injector Kill System Test.

Were any cylinders found to be faulty or low?

Yes

- Perform the CHECKING ENGINE MISFIRE / RUNS ROUGH / PERFORMANCE TEST diagnostic procedure. Refer to the appropriate information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [4](#)

4. CHECK FOR EXCESSIVE ENGINE OIL BEING INTRODUCED INTO THE AFTERTREATMENT SYSTEM

1. Turn the ignition off.
2. Remove the turbocharger outlet and inspect for signs of oil, fuel or moisture being introduced into the aftertreatment system from the engine.

Was engine oil, fuel or moisture found in the Turbocharger exhaust outlet?

Yes

- Locate the cause of possible diesel fuel or engine oil being carried from the engine into the exhaust system. Inspect the SCR Catalyst for possible damage.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [5](#)

5. CHECK THE DECOMPOSITION TUBE FOR DIESEL EXHAUST FLUID DEPOSITS

1. Remove the DEF Injector.
2. Visually inspect the Decomposition Tube for signs of diesel exhaust fluid crystals or deposits.

Were any deposits found?

Yes

- Remove the crystallization build up.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [6](#)

6. CHECK THE DEF INJECTOR FOR PROPER SPRAY VOLUME

1. Turn ignition off.
2. Remove the DEF Injector from the decomposition tube.

3. Place the DEF Injector in a container to capture the fluid sprayed.
4. Turn the ignition on.
5. With the scan tool, actuate the Diesel Exhaust Fluid Injector Quantity Test.

NOTE: This Test is broken up into three parts: 1-Air bleed/Build Pressure (about 30 seconds/then empty the container), 2-Main volume test (a little over one minute), 3-DEF purge (to remove excess fluid from the lines after the test). The entire procedure will run for 2-3 minutes before timing out. The amount of flow may fluctuate through out the test, therefore the test must be allowed to run completely in order for the results to be accurate. The fluid should spray out as a mist. There should be no dripping from the holes in the DEF Injector at any time during the duration of the test procedure.

6. Measure the amount of fluid sprayed after the test times out.

Does the fluid sprayed measure between 26 ml and 35 ml?

Yes

- Replace the NOx Sensor 1/2 in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Replace the DEF Injector in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

P2251-00-O2 SENSOR 1/1 NEGATIVE CURRENT CONTROL CIRCUIT/OPEN

For a complete AFTERTREATMENT SYSTEM wiring diagram, **refer to the appropriate wiring information**.

THEORY OF OPERATION

This vehicle is equipped with a 5-wire wide-band O2 Sensor. This sensor operates differently from traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement.

The Oxygen (O2) Sensor is used for fuel control and catalyst monitoring. The O2 Sensor measures the oxygen content of the exhaust stream. When the engine is started, the Powertrain Control Module (PCM) operates in an Open Loop mode, ignoring the O2 Sensor signal voltage while calculating the air-to-fuel ratio. The heating elements inside the O2 Sensor heats the sensor to bring it to operating conditions faster. This allows the system to enter Closed Loop earlier and the PCM to calculate the air-to-fuel ratio sooner. While the engine runs, the O2 Sensor heats up and begins to generate a voltage within a specified range. Once sufficient O2 Sensor voltage fluctuation is observed by the PCM, Closed Loop is entered. The PCM uses the O2 Sensor voltage to determine the air-to-fuel ratio. An O2 Sensor voltage that increases toward 1,000 mV indicates a rich fuel mixture. An O2 Sensor voltage that decreases toward 0 mV indicates a lean fuel mixture. The PCM makes short-term and long-term corrections to maintain stoichiometric air/fuel ratio for best catalytic converter efficiency. Short-term fuel correction is based directly on the O2 Sensor feedback and is designed for quick engine response. The long-term fuel correction compensates for variations in the engine specifications, sensor tolerances, and component aging. The PCM calculations of this feedback are designed to correct rich and lean conditions over a longer period of time. For an aged O2 Sensor, the response rate to air/fuel changes is slower than when it was new.

The O2 Sensor tends to move less with the same air/fuel changes in a given time frame. Therefore, by observing the activity of voltage readings (from the O2 Sensor), the quality of the sensor can be detected.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition.
- With the O2 Sensor 1/1 at operating temperature.

SET CONDITION

- The Powertrain Control Module (PCM) detects an open on the O2 Return Upstream circuit for 2.0 seconds.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
O2 RETURN UPSTREAM CIRCUIT OPEN/HIGH RESISTANCE
OXYGEN SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. CHECK THE O2 SENSOR (K902) RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Oxygen Sensor harness connector.

3. Disconnect the PCM C1 harness connector.
4. Measure the resistance of the O2 Sensor (K902) Return circuit between the Oxygen Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 3.0 Ohms?

Yes

- Repair the O2 Sensor (K902) Return circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [3](#)

3. INSTALL A NEW OXYGEN SENSOR AND RETEST FOR DTC

1. Turn the ignition off.
2. Reconnect the PCM C1 harness connector.
3. Install a new Oxygen Sensor in accordance with the Service Information.
4. Turn the ignition on.
5. With the scan tool, erase DTCs in the PCM.
6. Start the engine.
7. Allow the engine to reach normal operating temperature.
8. Test drive the vehicle and monitor the scan tool.
9. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [4](#)

No

- Test Complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.

- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- The wiring or poor connection problem has been repaired.
 - Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .
-

2021 AUTOMATIC TRANSMISSION

3.0L Diesel - DTCS U01B0-00 To U3017-00 - Gladiator [EXJ]

DIAGNOSIS AND TESTING

U01B0-00-LOST COMMUNICATION WITH BATTERY MONITOR MODULE

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

1. Ignition on, engine not running.
2. With the scan tool, select view DTCs.

Is the DTC Active at this time?

Yes

- Perform the U01B0-Lost Communication with Battery Monitor Module diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

No

- Perform the Stored Lost Communication DTCs diagnostic procedure. Refer to **STORED LOST COMMUNICATION DTCS** .

U0229-00-LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0284-00-LOST COMMUNICATION WITH ACTIVE GRILL SHUTTER MODULE 1

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running and battery voltage between 11.0 and 16.0 volts.
- Ambient Air Temperature or Engine Coolant Temperature above -7B°C (19.4B°F).

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a valid LIN BUS message from the Active Grill Shutter Assembly for 2.6 seconds.

DEFAULT ACTION

- The MIL will illuminate.
- If the Active Grill Shutter (AGS) detects a LIN Bus error it will default to open position.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
ACTIVE GRILL SHUTTER FUSED B+ CIRCUIT OPEN
ACTIVE GRILL SHUTTER FUSED B+ CIRCUIT SHORTED TO GROUND
ACTIVE GRILL SHUTTER GROUND CIRCUIT OPEN
ACTIVE GRILL SHUTTER ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Turn the ignition on.
2. With the scan tool, view DTCs.

Is the DTC active?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. INSPECT THE ACTIVE GRILL SHUTTER ASSEMBLY FOR SIGNS OF PHYSICAL DAMAGE

1. Inspect the Active Grill Shutter Assembly and connector for damage due to road debris.

Is the Active Grill Shutter Assembly or connector damaged or disconnected?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE (A940) FUSED B+ CIRCUIT FOR PROPER VOLTAGE

1. Turn the ignition off.
2. Disconnect the AGS harness connector.
3. Measure the voltage at the (A940) Fused B+ circuit at the AGS harness connector.

Is the voltage equal to battery voltage?

Yes

- Go To [4](#)

No

- Repair the (A940) Fused B+ circuit for an open or short to ground.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance between ground and the Ground circuit at the AGS harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [5](#)

No

- Repair the Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance between ground and the (D511) LIN BUS circuit at the AGS harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [6](#)

No

- Repair the (D511) LIN BUS circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN BUS circuit between the AGS harness connector and the PCM C1 harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [7](#)

No

- Repair the (D511) LIN BUS circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE ACTIVE GRILL SHUTTER ASSEMBLY FOR PROPER OPERATION

1. Replace the Active Grill Shutter Assembly in accordance with the service information. Navigate to Miscellaneous functions and perform the 'Active Grille Shutter Replaced' procedure.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. With the scan tool, actuate the AGS Assembly.
6. With the scan tool, view DTCs.

Did the DTC return?

Yes

- Go To [8](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

8. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

U029D-00-LOST COMMUNICATION WITH NOX SENSOR MODULE "A"

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a message from the NOx Sensor 1/1 over the Datalink circuits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
LOW DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT SHORT TO VOLTAGE
LOW DATALINK (-) CIRCUIT SHORT TO VOLTAGE
HIGH DATALINK (+) CIRCUIT SHORT TO GROUND
LOW DATALINK (-) CIRCUIT SHORT TO GROUND
NOX SENSOR 1/1
NOX SENSOR 1/2
PARTICULATE MATTER (PM) SENSOR

Possible Causes
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, record any environmental data and record all DTCs on the repair order.
3. With the scan tool, read DTCs.

Is DTC U029D Active?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P05F3 or P05F5 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM VOLTAGE FOR PROPER OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK FOR COMMUNICATION DTCS

1. USING THE SCAN TOOL READ ALL dtcS.

NOTE: The Datalinks are BUS circuits which the PCM uses to communicate with the Wastegate Solenoid, Particulate Matter Sensor, DEF Heating Control Unit, NOx Sensor 1/1 and Nox Sensor 1/2. If a Datalink circuit is shorted or one of these components is internally shorted, communication will be lost and DTCs will set against ALL of these components.

Are there lost communication DTCs present against any components (other than NOx 1/1) listed in the note above?

Yes

- Go To [2](#)

No

- Go To [5](#)

5. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE NOX SENSOR 1/1 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the NOx Sensor 1/1 Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the NOx Sensor 1/1 Ground circuit for an open. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Wastegate Solenoid, Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [7](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the DEF NOx Sensor 1/1 harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the DEF NOx Sensor 1/1 harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Replace the NOx 1/1 Sensor in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS FOR PROPER OPERATION

NOTE: Disconnect only one component at a time during this next step. If the DTCs for the components that are **STILL CONNECTED** change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.

1. Turn the ignition off.
2. Reconnect all four components connected to the Datalink circuits.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Turn the ignition off.
6. Disconnect the Particulate Matter Sensor harness connector. Cycle the ignition key on and off the three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

7. Turn the ignition off and reconnect the Particulate Matter Sensor harness connector.
8. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

9. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
10. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

11. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
12. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

Did the status of the DTCs change to stored for the components **STILL CONNECTED** when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE (Z909) NOX SENSOR 1/1 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/1 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the (Z909) NOx Sensor 1/1 Ground circuit at the NOx Sensor 1/1 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [11](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the (Z909) Ground circuit for an open. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Wastegate Solenoid, Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [12](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the NOx Sensor Module 1/1 harness connector and the PCM C1 harness connector.

2. Measure the resistance of the (D468) Low Datalink (-) circuit between the NOx Sensor Module 1/1 harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [13](#)

13. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [14](#)

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

14. CHECK THE NOX SENSOR 1/1 FOR PROPER OPERATION

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Replace the NOx Sensor 1/1 in accordance with the service information.
2. Reconnect the Wastegate Solenoid, Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [15](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

15. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).

- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U029E-00-LOST COMMUNICATION WITH NOX SENSOR MODULE "B"

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The aftertreatment system is equipped with two NOx Sensors. The upstream NOx Sensor 1/1 is located at the inlet elbow of the Diesel Exhaust Oxidation (DOC) Catalyst/Diesel Particulate Filter (DPF) and is permanently connected (via a permanent wiring harness) to the NOx Sensor 1/1 Module mounted toward the front frame rail at the rear of the right front wheel well. The downstream NOx Sensor 1/2 is located at the outlet of the Selective Catalytic Reduction (SCR) Catalyst and is permanently connected (via a permanent wiring harness) to the NOx Sensor Module 1/2 mounted along the left middle frame rail. The upstream NOx Sensor 1/1 measures the NOx concentration upstream of the Catalysts. The downstream NOx Sensor 1/2 measures the NOx concentration downstream of the Catalysts. The NOx Sensors also perform a heater strategy. The NOx Sensor module monitors the sensor temperature and operates a heater inside the NOx Sensor probe to maintain proper sensor operating temperature. The NOx Sensors are smart devices and communicate with the Powertrain Control Module (PCM) over designated Data Link circuits. The NOx Sensors perform their own internal diagnostics and report malfunctions back to the PCM. The NOx Sensors are used to monitor the efficiency of the SCR Catalyst and dosing system. The monitor compares the values from the NOx sensor to model based on ambient temperature and pressure, fuel quantity, boost pressure coolant temperature and EGR position. The PCM will illuminate the MIL lamp immediately after the monitor runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a message from the NOx Sensor 1/2 over the Datalink circuits.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
LOW DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT SHORT TO VOLTAGE
LOW DATALINK (-) CIRCUIT SHORT TO VOLTAGE
HIGH DATALINK (+) CIRCUIT SHORT TO GROUND

Possible Causes
LOW DATALINK (-) CIRCUIT SHORT TO GROUND
NOX SENSOR 1/2
NOX SENSOR 1/1
PARTICULATE MATTER (PM) SENSOR
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Ignition on, engine not running.
2. With the scan tool, record any environmental data and record all DTCs on the repair order.
3. With the scan tool, read DTCs.

Is DTC U029E Active?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P05F3 or P05F5 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK FOR OTHER COMPONENTS SETTING COMMUNICATION DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The Datalinks are BUS circuits which the PCM uses to communicate with the Particulate Matter Sensor, DEF Heating Control Unit, NOx Sensor 1/1 and Nox Sensor 1/2. If a Datalink circuit is shorted or one of these components is internally shorted, communication will be lost and DTCs will set against ALL of these components.

Are there lost communication DTCs present against any components (other than NOx 1/2) listed in the note above?

Yes

- Go To [2](#)

No

- Go To [5](#)

5. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE NOX SENSOR 1/2 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the NOx Sensor 1/2 Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the NOx Sensor 1/2 Ground circuit for an open. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.

4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [7](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the DEF NOx Sensor 1/1 harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the DEF NOx Sensor 1/1 harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Replace the NOx 1/2 Sensor in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS

NOTE: Disconnect only one component at a time during this next step. If the DTCs for the components that are **STILL CONNECTED** change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.

1. Turn the ignition off.
2. Reconnect all four components connected to the Datalink circuits.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Turn the ignition off.
6. Disconnect the Particulate Matter Sensor harness connector. Cycle the ignition key on and off the three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

7. Turn the ignition off and reconnect the Particulate Matter Sensor harness connector.
8. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

9. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
10. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

11. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
12. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

Did the status of the DTCs change to stored for the components **STILL CONNECTED** when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions>

SCR Extend Mileage W Active Fault (and reset the Timer).

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [10](#)

10. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE (Z909) NOX SENSOR 1/2 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the NOx Sensor 1/2 Sensor (vehicle harness) harness connector.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the (Z909) NOx Sensor 1/1 Ground circuit at the NOx Sensor 1/2 (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [11](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the (Z909) Ground circuit for an open. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

11. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [12](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

12. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the NOx Sensor Module 1/2 harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the NOx Sensor Module 1/2 harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [13](#)

13. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [14](#)

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

14. CHECK THE NOX SENSOR 1/2 FOR PROPER OPERATION

The NOx Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

CAUTION: Do not attempt to disconnect the NOx harness connector between the NOx Sensor Probe and the NOx Sensor Module. This connector is permanently attached to the NOx Sensor Module. Any attempt to remove this connector will permanently damage the NOx Sensor.

1. Replace the NOx Sensor 1/2 in accordance with the service information.
2. Reconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Turn the ignition on.

4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [15](#)

No

- Test complete. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

15. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module in accordance with the service information. Reset the SCR Timer: Using the scan tool, Go to Misc. Functions> SCR Extend Mileage W Active Fault (and reset the Timer).
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

U02A2-00-LOST COMMUNICATION WITH REDUCTANT QUALITY MODULE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Quality Sensor is welded to the DEF tank and is used to detect the concentration of the DEF. The DEF Quality Sensor shares information with the Powertrain Control Module (PCM) over designated Data Link circuits. To determine the DEF concentration, the DEF Quality Sensor transmits an ultrasonic signal to measure the density of the DEF. It also has an internal temperature sensor to measure the temperature of the DEF. This diagnostic runs continuously with the key on, and the PCM will illuminate the MIL after the diagnostic runs and fails during a drive cycle. The PCM will turn off the MIL after the diagnostic runs and passes in three consecutive drive cycles.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- Data link information between the DEF Quality Sensor and the PCM has been lost.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
DEF QUALITY SENSOR CONNECTOR CORROSION OR FOREIGN MATERIAL
FUSED ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
DEF QUALITY SENSOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
DATALINK (+) CIRCUIT SHORTED TO BATTERY OR GROUND
DATALINK (-) CIRCUIT SHORTED TO BATTERY OR GROUND
DATALINK (+) CIRCUIT SHORTED TO ANOTHER CIRCUIT
DATALINK (-) CIRCUIT SHORTED TO ANOTHER CIRCUIT
DATALINK COMPONENT INTERNALLY SHORTED
DEF QUALITY SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, record any environmental data and record all DTCs on the repair order.
3. With the scan tool, read DTCs.

Is this DTC Active?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The Datalink is a BUS circuit which the PCM uses to communicate with the DEF Quality Sensor, Turbo Actuator, DEF Heater Control Unit, NOx Sensor 1/1, NOx Sensor 1/2, Intake Swirl Actuator, and Particulate Matter (PM) Sensor. If the Datalink in the engine harness or vehicle harness is shorted, communication lost DTC's will be set against these devices. These devices share the same fused battery supply circuit in the PDC. All sensors will lose communication and set DTCs if the fuse is blown.

Are there lost communication DTCs present against ALL the components listed above?

Yes

- Go To [7](#)

No

- Go To [3](#)

3. CHECK THE DEF QUALITY SENSOR CONNECTOR FOR CORROSION OR FOREIGN MATERIAL

1. Turn the ignition on.
2. With the scan tool, record all Freeze frame data.
3. With the scan tool, erase DTCs.
4. Disconnect the DEF Quality Sensor harness connector.

NOTE: Check connectors for corrosion or foreign materials- Clean/repair as necessary.

5. Reconnect the DEF Quality Sensor harness connector.
6. Test drive the vehicle for an extended amount of time.

Did the DTC return?

Yes

- Go To [4](#)

No

- Repair is complete.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Is the system voltage normal?

Yes

- Go To [5](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE DEF QUALITY SENSOR POWER AND GROUND CIRCUITS FOR PROPER OPERATION

1. Turn the ignition on, engine not running.
2. Disconnect the DEF Quality Sensor harness connector.
3. Measure the voltage across the (F343) ASD Supply circuit and the (Z908) Ground circuit at the DEF Quality Sensor harness connector.

Does the voltage read within 1.0 volt of Battery voltage?

Yes

- Go To [6](#)

No

- Repair the (F343) ASD Supply circuit for an open or short to ground, or check the (Z908) Ground circuit for an open/high resistance.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE J1939 DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the NOx Sensor Module 1/1 harness connector.
3. Disconnect the NOx Sensor Module 1/2 harness connector.
4. Disconnect the DEF Quality Sensor harness connector.
5. Disconnect the Turbo Actuator harness connector.
6. Disconnect the PM Sensor harness connector.
7. Disconnect the Intake Swirl Actuator harness connector.
8. Disconnect the DEF Heater Control Unit harness connector.
9. Disconnect the PCM C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

10. Measure the resistance of the (D469) Datalink (+) circuit between the DEF Quality Sensor harness connector and the PCM C1 harness connector.
11. Measure the resistance of the (D468) Datalink (-) circuit between the DEF Quality Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms for both circuits?

Yes

- Replace the DEF Quality Sensor in accordance with the Service Information.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Repair the Datalink circuit that measured above 3.0 Ohms for an open or high resistance.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

7. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS

NOTE: Disconnect only one component at a time during this next step. If the DTCs for the components that are **STILL CONNECTED** change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.

1. Turn the ignition off.
2. Disconnect the DEF Quality Sensor harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

3. Turn the ignition off and reconnect the DEF Quality Sensor harness connector.
4. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

5. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
6. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

7. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
8. Disconnect the Turbo Actuator harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

9. Turn the ignition off and reconnect the Turbo Actuator harness connector.
10. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

11. Turn the ignition off and reconnect the DEF Heater Control Unit harness connector.
12. Disconnect the Intake Swirl Actuator harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

13. Turn the ignition off and reconnect the Intake Swirl Actuator harness connector.
14. Disconnect the PM Sensor harness connector. Cycle the ignition key on and off 3 times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

15. Turn the ignition off and reconnect the PM Sensor harness connector.

Did the status of the DTCs change to stored for the components STILL CONNECTED when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the Service Information.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC

message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.

- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the NOx Sensor Module 1/1, NOx Sensor Module 1/2, DEF Heater Control Unit, DEF Quality Sensor, Turbo Actuator, Intake Swirl Actuator, PM Sensor, and PCM C1 harness connectors.
3. Measure for continuity between ground and the (D469) Datalink (+) circuit at the PCM C1 harness connector.
4. Measure for continuity between ground and the (D468) Datalink (-) circuit at the PCM C1 harness connector.

Is there continuity between ground and either Datalink circuit?

Yes

- Repair the Datalink circuit that measured a short to ground.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK THE DATALINK CIRCUITS FOR A SHORT TO OTHER CIRCUITS

1. Measure for continuity between the (D469) Datalink (+) circuit at the PCM C1 harness connector and all other circuits in the PCM C1 harness connector.
2. Measure for continuity between the (D468) Datalink (-) circuit at the PCM C1 harness connector and all other circuits in the PCM C1 harness connector.

NOTE: **Disregard any resistance between 50 and 70 Ohms between the (D469) Datalink (+) circuit and the (D468) Datalink (-) pins.**

Is there continuity between the Datalink circuits and any other circuits?

Yes

- Repair the Datalink circuit for a short another circuit.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D468) Datalink (-) circuit between the DEF Quality Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D469) Datalink (+) circuit between the DEF Quality Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms for both circuits?

Yes

- Go To [11](#)

No

- Repair the Datalink circuit for an open or high resistance.
- After the appropriate repair has been made, the vehicle must be operated in the manner described in the "When Monitored" information above to clear the inducement and the EVIC message. Clearing the code will not clear the inducement or the EVIC message. In the extreme situation that the diagnostic will not run again, the PCM can be reflashed to clear the inducement and the EVIC message.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

U02A5-00-LOST COMMUNICATION WITH REDUCTANT HEATER CONTROL MODULE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on. During DEF system actuation.

SET CONDITION

- The PCM receives an implausible Bus Message from the HCU for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DATA LINK (-) CIRCUIT SHORTED TO VOLTAGE
LOW DATA LINK (-) CIRCUIT SHORTED TO GROUND
LOW DATA LINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATA LINK (+) CIRCUIT SHORTED TO VOLTAGE
HIGH DATA LINK (+) CIRCUIT SHORT TO GROUND
HIGH DATA LINK (+) CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND

Possible Causes
DEF HCU GROUND CIRCUIT OPEN/HIGH RESISTANCE
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the DEF HCU harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D468) Low Data Link (-) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [3](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D468) Low Data Link (-) circuit at the DEF HCU harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D468) Low Data Link (-) circuit between the DEF HCU harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D468) Low Data Link (-) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Measure the resistance between the (D469) High Data Link (+) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [6](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D469) High Data Link (+) circuit at the DEF HCU harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Data Link (+) circuit between the DEF HCU harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D469) High Data Link (+) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (F343) ASD SUPPLY CIRCUIT, (A914) FUSED B+ CIRCUIT AND THE (Z909) HCU GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the ignition on, engine off.
3. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector. Then, measure the voltage across the (A914) Fused B+ circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit or the (A914) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [9](#)

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF HCU and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK THE DEF HCU FOR PROPER OPERATION

1. Replace the DEF Heater Control Unit (HCU) in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.

4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

U0402-00-IMPLAUSIBLE DATA RECEIVED FROM TCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

U0403-00-IMPLAUSIBLE DATA RECEIVED FROM TCASE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

U0405-00-IMPLAUSIBLE DATA RECEIVED FROM CRUISE CONTROL MODULE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition.

SET CONDITION

- An error message has been received over the BUS from the Adaptive Cruise Control Module (ACCM).

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
CAN BUS OPEN OR SHORTED CONDITION
ADAPTIVE CRUISE CONTROL MODULE (ACCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With a scan tool, view DTCs.

NOTE:

If the scan tool indicates that a flash is available for the ACCM, perform the ACCM flash, erase the DTC in the PCM, and verify that the DTC returns before continuing with this test procedure.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT DTC diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any CAN B and C communication DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR ACCM COMMUNICATION RELATED DTCs IN OTHER MODULES

1. With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the ACCM at this time?

Yes

- Replace and program the Adaptive Cruise Control Module (ACCM) in accordance with the service information.
- Perform the ADAPTIVE CRUISE CONTROL MODULE (ACCM) VERIFICATION TEST.

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U0407-00-IMPLAUSIBLE DATA RECEIVED FROM GLOW PLUG CONTROL MODULE

For a complete GLOW PLUG SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Glow Plug Module is located next to the passenger side shock tower. The Glow Plug Module receives a 12-volt supply from the Power Distribution Center (PDC). The Glow Plug Module supplies power to the Glow Plugs and a ground path is provided through the body of the Glow Plugs. The Glow Plug Module communicates with the PCM over the LIN BUS circuit.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Glow Plug Module for 2.0 seconds. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
GENERATOR
LIN BUS CIRCUIT SHORTED TO GROUND

Possible Causes
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT SHORTED TO VOLTAGE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND
GLOW PLUG MODULE GROUND CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Turn the ignition off. Leave the ignition off for 5 minutes.
4. Start the engine.
5. Allow the engine to run for 2 minutes.
6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

2. CHECK THE GENERATOR FOR PROPER OPERATION

1. Turn the ignition off. Leave it off for 5 minutes.
2. Disconnect the Generator Module harness connector.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Crank the engine for no more than 10 seconds if it will not start.
6. With the scan tool, select View DTCs.

Is DTC P0683-00, U0106-00, or U0407-00 active?

Yes

- If it is this DTC that reset, Go To [3](#)
- If it is one of the other two DTCs that reset, perform the Diagnostics for those DTCs before continuing with this one.

No

- Replace the Generator in accordance with the service information.

- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT IN THE PCM C1 CONNECTOR HARNESS

1. Turn the ignition off.
2. Disconnect the Glow Plug Module harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D511) LIN Bus circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [4](#)

No

- Repair the (D511) LIN Bus circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D511) LIN Bus circuit at the Glow Plug Module harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [5](#)

No

- Repair the (D511) LIN Bus circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN Bus circuit between the Glow Plug Module harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D511) LIN Bus circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE (F343) ASD SUPPLY CIRCUIT, (A29) FUSED B+ CIRCUIT AND THE (Z909) GLOW PLUG MODULE GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the engine on.
3. Turn the ignition on, engine off.

4. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector. Then, measure the voltage across the (A29) Fused B+ circuit and the (Z909) Glow Plug Module Ground circuit at the Glow Plug Module harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit or the (A29) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [7](#)

7. CHECK THE GLOW PLUG MODULE WIRE HARNESS AND CONNECTORS FOR DAMAGE

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug Module and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [8](#)

8. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Replace the Glow Plug Module in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Turn the ignition off. Leave the ignition off for 5 minutes.
5. Start the engine.
6. Allow the engine to run for 2 minutes.
7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [9](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

9. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

U040D-00-IMPLAUSIBLE DATA RECEIVED FROM TURBOCHARGER/SUPERCHARGER CONTROL MODULE

For a complete INTAKE AIR SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Boost Pressure Actuator is an electronically operated DC motor designed to regulate the boost pressure output of the turbocharger. the boost pressure actuator is mounted on the side of the turbocharger assembly. The PCM will run a test to evaluate the response from the boost pressure actuator by commanding the actuator to

move through its full position range for a calibrated time. During the test the PCM will evaluate the response based on a calculated characteristic value which is calculated from the exhaust pressure changes seen during the test. This test is only done once per drive cycle while the engine is idling and the engine coolant temperature is above 75B°C (167B°F).

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Turbocharger Boost Actuator for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DATA LINK (-) CIRCUIT SHORTED TO VOLTAGE
LOW DATA LINK (-) CIRCUIT SHORTED TO GROUND
LOW DATA LINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATA LINK (+) CIRCUIT SHORTED TO VOLTAGE
HIGH DATA LINK (+) CIRCUIT SHORT TO GROUND
HIGH DATA LINK (+) CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT OPEN/HIGH RESISTANCE
TURBOCHARGER BOOST ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TROUBLE CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Refer to **STORED LOST COMMUNICATION DTCS** and perform the Stored Lost Communication DTCs diagnostic procedure.

2. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the Turbocharger Boost Actuator harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D468) Low Data Link (-) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [3](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

3. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D468) Low Data Link (-) circuit at the Turbocharger Boost Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

4. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D468) Low Data Link (-) circuit between the Turbocharger Boost Actuator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D468) Low Data Link (-) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [5](#)

5. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Measure the resistance between the (D469) High Data Link (+) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [6](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D469) High Data Link (+) circuit at the Turbocharger Boost Actuator harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Data Link (+) circuit between the Turbocharger Boost Actuator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D469) High Data Link (+) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE (F343) ASD SUPPLY CIRCUIT AND THE (Z909) TURBOCHARGER BOOST ACTUATOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the engine on.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) HCU Ground circuit at the Turbocharger Boost Actuator harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [9](#)

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Turbocharger Boost Actuator and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK THE TURBOCHARGER BOOST ACTUATOR FOR PROPER OPERATION

1. Replace the Turbocharger in accordance with the Service Information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0418-IMPLAUSIBLE DATA RECEIVED FROM BRAKE SYSTEM CONTROL MODULE 1

NOTE: Treat this DTC as an IMPLAUSIBLE SIGNAL DTC when performing the COMMUNICATION DIAGNOSTIC PROCEDURE.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#) .

U0420-00-INVALID DATA RECEIVED FROM POWER STEERING CONTROL MODULE A

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0421-00-IMPLAUSIBLE DATA RECEIVED FROM SUSPENSION CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0423-00-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0429-00-IMPLAUSIBLE DATA RECEIVED FROM SCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0452-00-IMPLAUSIBLE DATA RECEIVED FROM RESTRAINTS CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U04A4-00-IMPLAUSIBLE DATA RECEIVED FROM PM SENSOR

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

Continuously with the ignition on.

SET CONDITION

The Powertrain Control Module (PCM) does not receive a message from the Particulate Matter Sensor over the Datalink circuits.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE

Possible Causes
FUSED IGNITION SWITCH CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
LOW DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT SHORT TO VOLTAGE
LOW DATALINK (-) CIRCUIT SHORT TO VOLTAGE
HIGH DATALINK (+) CIRCUIT SHORT TO GROUND
LOW DATALINK (-) CIRCUIT SHORT TO GROUND
NOX SENSOR 1/1
NOX SENSOR 1/2
PARTICULATE MATTER (PM) SENSOR
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Is this DTC active?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P05F3 or P05F5 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK FOR OTHER DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The Datalinks are BUS circuits which the PCM uses to communicate with the Particulate Matter Sensor, DEF Heating Control Unit, NOx Sensor 1/1 and Nox Sensor 1/2. If a Datalink circuit is shorted or one of these components is internally shorted, communication will be lost and DTCs will set against ALL of these components.

Are there lost communication DTCs present against any components (other than Particulate Matter Sensor) listed in the note above?

Yes

- Go To [9](#)

No

- Go To [5](#)

5. CHECK THE FUSED IGNITION SWITCH CIRCUIT AND THE PARTICULATE MATTER SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

6. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.

4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [7](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

7. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Replace the Particulate Matter Sensor in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS FOR PROPER OPERATION

NOTE: Disconnect only one component at a time during this next step. If the DTCs for the components that are **STILL CONNECTED** change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.

1. Turn the ignition off.
2. Reconnect all four components connected to the Datalink circuits.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Turn the ignition off.
6. Disconnect the Particulate Matter Sensor harness connector. Cycle the ignition key on and off the three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

7. Turn the ignition off and reconnect the Particulate Matter Sensor harness connector.
8. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

9. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
10. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

11. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
12. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

Did the status of the DTCs change to stored for the components **STILL CONNECTED** when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [10](#)

10. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE NOX SENSOR 1/1 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [11](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [12](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [13](#)

13. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [14](#)

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

14. CHECK THE PARTICULATE MATTER SENSOR FOR PROPER OPERATION

The Particulate Matter Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Replace the Particulate Matter Sensor in accordance with the service information.
2. Reconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [15](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

15. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

U04B1-00-IMPLAUSIBLE DATA RECEIVED FROM BATTERY MONITOR MODULE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) receives an invalid signal from the Intelligent Battery Sensor (IBS).

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTELLIGENT BATTERY SENSOR (IBS)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Turn the ignition on.
2. With the scan tool, read the DTCs.

Does the scan tool display this DTC as active?

Yes

- Replace the Intelligent Battery Sensor (IBS) in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals and correct pin tension.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

U059E-00-IMPLAUSIBLE DATA RECEIVED NOX SENSOR MODULE 1

WHEN MONITORED

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a plausible Private CAN Bus message from the NOX Sensor 1 Module.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 1 MODULE POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other NOX Sensor 1 Module DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. REPLACE THE NOX SENSOR 1 MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the NOX Sensor 1 Module in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.

7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the NOX Sensor 1 Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND](#)

INSTALLATION

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

U059F-00-IMPLAUSIBLE DATA RECEIVED NOX SENSOR MODULE 2

WHEN MONITORED

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a plausible Private CAN Bus message from the NOX Sensor 2 Module.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
NOX SENSOR 2 MODULE POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PCM VERIFICATION TEST.**

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.

4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any other NOX Sensor 2 Module DTCs present?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [4](#)

4. REPLACE THE NOX SENSOR 2 MODULE AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the NOX Sensor 2 Module in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.
8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replacing the NOX Sensor 2 Module repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.

2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

U05A3-00-INVALID DATA RECEIVED FROM REDUCTANT QUALITY MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U05A4-00-PM SENSOR RECEIVED IMPLAUSIBLE DATA FROM PCM

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, .

WHEN MONITORED

Continuously with the ignition on.

SET CONDITION

The Powertrain Control Module (PCM) does not receive a message from the Particulate Matter Sensor over the Datalink circuits.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
LOW DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT SHORT TO VOLTAGE
LOW DATALINK (-) CIRCUIT SHORT TO VOLTAGE
HIGH DATALINK (+) CIRCUIT SHORT TO GROUND
LOW DATALINK (-) CIRCUIT SHORT TO GROUND
NOX SENSOR 1/1
NOX SENSOR 1/2
PARTICULATE MATTER (PM) SENSOR
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Is this DTC active?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P05F3 or P05F5 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK FOR OTHER DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The Datalinks are BUS circuits which the PCM uses to communicate with the Particulate Matter Sensor, DEF Heating Control Unit, NOx Sensor 1/1 and Nox Sensor 1/2. If a Datalink circuit is shorted or one of these components is internally shorted, communication will be lost and DTCs will set against ALL of these components.

Are there lost communication DTCs present against any components (other than Particulate Matter Sensor) listed in the note above?

Yes

- Go To [9](#)

No

- Go To [5](#)

5. CHECK THE FUSED IGNITION SWITCH CIRCUIT AND THE PARTICULATE MATTER SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

6. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [7](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

7. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Replace the Particulate Matter Sensor in accordance with the service information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

9. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS FOR PROPER OPERATION

NOTE: **Disconnect only one component at a time during this next step. If the DTCs for the components that are STILL CONNECTED change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.**

1. Turn the ignition off.
2. Reconnect all four components connected to the Datalink circuits.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Turn the ignition off.
6. Disconnect the Particulate Matter Sensor harness connector. Cycle the ignition key on and off the three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

7. Turn the ignition off and reconnect the Particulate Matter Sensor harness connector.
8. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

9. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
10. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

11. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
12. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

Did the status of the DTCs change to stored for the components STILL CONNECTED when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [10](#)

10. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE NOX SENSOR 1/1 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [11](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [12](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

12. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Go To [13](#)

13. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [14](#)

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

14. CHECK THE PARTICULATE MATTER SENSOR FOR PROPER OPERATION

The Particulate Matter Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Replace the Particulate Matter Sensor in accordance with the service information.
2. Reconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [15](#)

No

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

15. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U05A6-00-IMPLAUSIBLE DATA RECEIVED FROM REDUCTANT HEATER CONTROL MODULE

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

THEORY OF OPERATION

The Diesel Exhaust Fluid (DEF) Heater Control Unit (HCU) operates three heater elements to help eliminate freezing of the DEF. One is the DEF Tank Heater Element (sometimes called the 'Suction Line Heater' or 'Heater 1'). One is the Pressure Line Heater Element ('Heater 2'). The other is in the DEF tank. The HCU interfaces with the Powertrain Control Module (PCM) over two dedicated CAN Bus circuits. The DEF Level/Temperature Sensor reports the temperature of the DEF inside the tank back to the PCM. The PCM determines the heater actuation times and conductance. The HCU receives these commands from the PCM and activates the heater elements as needed. The HCU receives power directly from the vehicle battery to supply the heaters. The PCM illuminates the MIL lamp immediately after the diagnostic runs and fails.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on. During DEF system actuation.

SET CONDITION

- The PCM receives an implausible Bus Message from the HCU for a calibrated amount of time. This is a two Trip Fault.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LOW DATA LINK (-) CIRCUIT SHORTED TO VOLTAGE
LOW DATA LINK (-) CIRCUIT SHORTED TO GROUND
LOW DATA LINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATA LINK (+) CIRCUIT SHORTED TO VOLTAGE
HIGH DATA LINK (+) CIRCUIT SHORT TO GROUND
HIGH DATA LINK (+) CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
ASD SUPPLY CIRCUIT SHORT TO GROUND
FUSED B+ CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ CIRCUIT SHORT TO GROUND
DEF HCU GROUND CIRCUIT OPEN/HIGH RESISTANCE
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Start the engine.
4. Allow the engine to reach normal operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the DEF HCU harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D468) Low Data Link (-) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [3](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D468) Low Data Link (-) circuit at the DEF HCU harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [4](#)

No

- Repair the (D468) Low Data Link (-) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE (D468) LOW DATA LINK (-) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D468) Low Data Link (-) circuit between the DEF HCU harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D468) Low Data Link (-) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [5](#)

5. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Measure the resistance between the (D469) High Data Link (+) circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [6](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

6. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D469) High Data Link (+) circuit at the DEF HCU harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D469) High Data Link (+) circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

7. CHECK THE (D469) HIGH DATA LINK (+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Data Link (+) circuit between the DEF HCU harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D469) High Data Link (+) circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [8](#)

8. CHECK THE (F343) ASD SUPPLY CIRCUIT, (A914) FUSED B+ CIRCUIT AND THE (Z909) HCU GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Reconnect the PCM C1 harness connector.
2. Turn the ignition on, engine off.

3. Measure the voltage across the (F343) ASD Supply circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector. Then, measure the voltage across the (A914) Fused B+ circuit and the (Z909) HCU Ground circuit at the DEF HCU harness connector.

Was the difference of either voltage reading greater than 1.0 Volts of battery voltage?

Yes

- Repair the (F343) ASD Supply circuit or the (A914) Fused B+ circuit for an open or short to ground, or check the (Z909) Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [9](#)

9. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the DEF HCU and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

No

- Go To [10](#)

10. CHECK THE DEF HCU FOR PROPER OPERATION

1. Replace the DEF Heater Control Unit (HCU) in accordance with the service information.
2. Turn the ignition on.
3. With the scan tool, erase PCM DTCs.
4. Start the engine and run it until it reaches operating temperature.
5. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

6. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [11](#)

No

- Test complete.

- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

11. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U060F-00-LOST COMMUNICATION WITH MASS OR VOLUME AIR FLOW SENSOR A **WHEN MONITORED**

This diagnostic runs continuously when the following conditions are met:

- The ignition is on for greater than five seconds.
- The battery voltage is between 10.0 and 16.0 volts.

SET CONDITION

- When the Powertrain Control Module (PCM) detects no communication with the Mass Air Flow (MAF) Sensor over the LIN Bus.

POSSIBLE CAUSES

Possible Causes
LIN BUS CIRCUIT SHORTED TO VOLTAGE
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
ASD RELAY OUTPUT CIRCUIT OPEN/HIGH RESISTANCE
GROUND CIRCUIT OPEN/HIGH RESISTANCE
MASS AIR FLOW (MAF) SENSOR
UREA PUMP
POWERTRAIN CONTROL MODULE (PCM)

Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR ANY SERVICE BULLETINS OR PCM SOFTWARE UPDATES

1. Check for any applicable Service Bulletins or Flash updates related to the DTC.

Are there any applicable Service Bulletins or Flash updates?

Yes

- Perform the applicable repair.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [2](#)

2. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 10.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCS.

Is the DTC U0623-00-LOST COMMUNICATION WITH UREA INJECTOR COOLING PUMP also present?

Yes

- Go To [4](#)

No

- Go To [8](#)

4. DISCONNECT THE UREA PUMP AND RETEST FOR DTCS

1. Turn the ignition off.
2. Disconnect the UREA Pump harness connector.
3. Turn the ignition on.
4. With the scan tool, erase all DTCS.
5. Turn the ignition off for a minimum of 10.0 seconds.
6. Turn the ignition on.
7. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
8. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [5](#)

No

- Replace the UREA Pump in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

5. CHECK THE (D509) LIN BUS CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

1. Turn the ignition off.
2. Disconnect the MAF Sensor harness connector.
3. Disconnect the PCM C1 harness connector.
4. Check for continuity between the (D509) LIN Bus circuit and every other circuit at the PCM C1 harness connector.

Is there any continuity between the (D509) LIN Bus circuit and any other circuit?

Yes

- Repair the (D509) LIN Bus circuit for a short to the circuit(s) that showed continuity.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [6](#)

6. CHECK THE (D509) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Check for continuity between ground and the (D509) LIN Bus circuit at the MAF Sensor harness connector.

Is there continuity between ground and the (D509) LIN Bus circuit?

Yes

- Repair the (D509) LIN Bus circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [7](#)

7. CHECK THE (D509) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D509) LIN Bus circuit between the MAF Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [11](#)

No

- Repair the (D509) LIN Bus circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

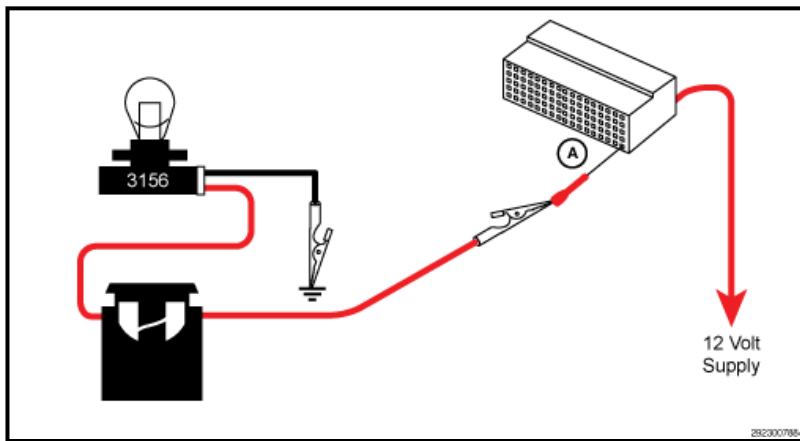
8. CHECK THE ASD RELAY (F343) OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

1. Turn the ignition off.
2. Disconnect the MAF Sensor harness connector.

CAUTION: Do not load test any circuits with components still connected to the circuit.

3. Turn the ignition on.
4. Load test the ASD Relay (F343) Output circuit at the MAF Sensor harness connector. **Note:** refer to the example illustration.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [9](#)

No

- Repair the ASD Relay (F343) Output circuit for an open or high resistance. If the fuse is found to be open, check the circuit for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

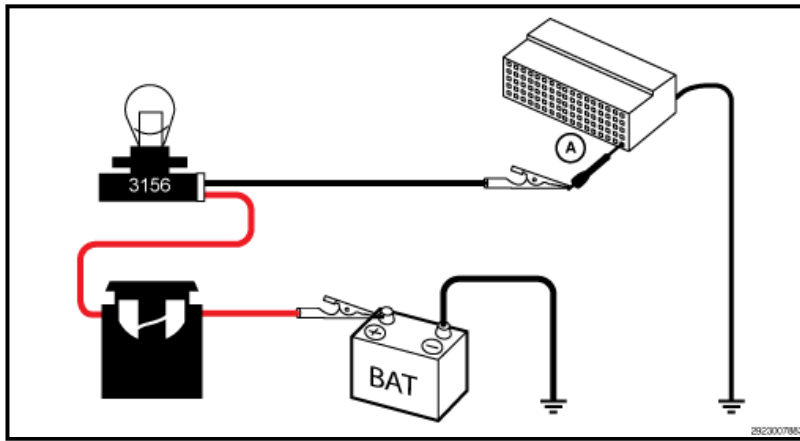
9. CHECK THE (K957) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT

NOTE: Read the **CIRCUIT LOAD TESTING PROCEDURE** for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to [CIRCUIT LOAD TESTING PROCEDURES](#).

1. Turn the ignition off.

CAUTION: Do not load test any circuits with components still connected to the circuit.

2. Load test the (K957) Ground circuit at the MAF Sensor harness connector (A). **Note:** refer to the diagram below.



NOTE: The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry. Compare the brightness of the bulb in the load test tool to that of a direct connection across Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To [10](#)

No

- Repair the (K957) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

10. CHECK THE (D509) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the (D509) LIN Bus circuit between the MAF Sensor harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [11](#)

No

- Repair the (D509) LIN Bus circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

11. REPLACE THE MAF SENSOR AND RETEST FOR DTCS

1. Turn the ignition off.
2. Replace the MAF Sensor in accordance with the Service Information.
3. Connect all disconnected harness connectors.
4. Turn the ignition on.
5. With the scan tool, erase all DTCs.
6. Turn the ignition off for a minimum of 10.0 seconds.
7. Turn the ignition on.

8. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
9. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Replacing the MAF Sensor repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to [MODULE, POWERTRAIN CONTROL \(PCM\), REMOVAL AND INSTALLATION](#) .

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

U1008-00-LIN 1 BUS

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the LIN BUS 1 circuit is outside of a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LIN BUS 1 CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS 1 CIRCUIT SHORT TO GROUND
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCS in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCS.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCS.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. ISOLATE AND CHECK THE LIN BUS 1 (D509) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. ISOLATE AND CHECK THE LIN BUS 1 (D509) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: There should be no continuity between ground and the circuit being tested.

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

U1009-00-LIN 2 BUS

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the LIN BUS 2 circuit is outside of a calibrated threshold.

DEFAULT ACTION

- The MIL is illuminated.

POSSIBLE CAUSES

Possible Causes
LIN BUS 2 CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS 2 CIRCUIT SHORT TO GROUND
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE**.

DIAGNOSTIC TEST

1. READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for a minimum of 75.0 seconds.
5. Turn the ignition on.
6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC**.

2. ISOLATE AND CHECK THE LIN BUS 2 (D511) CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

Is the resistance below 3.0 Ohms?

Yes

- Go To [3](#)

No

- Repair the circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST**.

3. ISOLATE AND CHECK THE LIN BUS 2 (D511) CIRCUIT FOR A SHORT TO GROUND

1. The ignition must be off when checking a circuit for continuity to ground.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the appropriate wiring diagram as a guide to follow the path of the circuit.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the appropriate wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [4](#)

4. CHECK RELATED PCM AND COMPONENT CONNECTIONS

1. Perform any Service Bulletins that apply.
2. Disconnect all PCM harness connectors.
3. Disconnect all related in-line harness connections (if equipped).
4. Disconnect the related component harness connectors.
5. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

6. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
11. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to **MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION** .
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

U1121-00-LOST COMMUNICATION WITH LIN ECU 1

For a complete GLOW PLUG SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

SET CONDITION

- When the Powertrain Control Module (PCM) detects there is no LIN Bus communication from the Glow Plug Module and/or the Alternator.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
LIN 1 BUS CIRCUIT SHORTED TO GROUND
LIN 1 BUS CIRCUIT SHORTED TO VOLTAGE
LIN 1 BUS CIRCUIT OPEN/HIGH RESISTANCE
GLOW PLUG MODULE
ALTERNATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Turn the ignition on.
2. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Go To [2](#)

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals and correct pin tension.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

2. CHECK FOR AN ACTIVE DTC WITH THE GLOW PLUG MODULE

1. Turn the ignition off.
2. Disconnect the Glow Plug Module harness connector.
3. Turn the ignition on.
4. Wait 10 seconds.
5. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Go To [3](#)

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

3. CHECK FOR AN ACTIVE DTC WITH THE ALTERNATOR

1. Turn the ignition off.
2. Disconnect the Alternator harness connector.
3. Turn the ignition on.
4. Wait 10 seconds.
5. With the scan tool, read DTCs.

Does the scan tool display this DTC as active?

Yes

- Go To [4](#)

No

- Replace the Alternator in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE LIN BUS CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the PCM C1 harness connector.
3. Measure the resistance between the LIN Bus circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Repair the LIN Bus circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [5](#)

5. CHECK THE LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.
2. Measure the resistance of the LIN Bus circuit between the Glow Plug Module harness connector and the PCM C1 harness connector. Also, measure the resistance of the LIN Bus circuit between the Alternator harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the LIN Bus circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [6](#)

6. CHECK THE LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the LIN Bus circuit.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the short to ground in the LIN Bus circuit.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

U11A3-00-LOST BRAKE PRESSURE SENSOR 1 MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 11.0 volts.
- Electric Stop/Start (ESS) feature is enabled.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive the Brake Pressure Sensor 1 message over the CAN C bus from the Anti-Lock Brake System (ABS) Module.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTEGRATED CONTROL UNIT (ICU)
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.

2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE ANTI-LOCK BRAKE MODULE FOR BPP SENSOR FAULTS

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against a Brake Pressure Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

No

- Replace the ABS Module in accordance with the Service Information. Refer to [MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION](#) .
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

U11A4-00-LOST BRAKE PRESSURE SENSOR 2 MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 11.0 volts.
- Electric Stop/Start (ESS) feature is enabled.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive the Brake Pressure Sensor 2 message over the CAN C bus from the Anti-Lock Brake System (ABS) Module.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
INTEGRATED CONTROL UNIT (ICU)
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to [INTERMITTENT DTC](#) .

2. CHECK THE ANTI-LOCK BRAKE MODULE FOR BPP SENSOR FAULTS

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against a Brake Pressure Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to [ANTILOCK BRAKE SYSTEM \(ABS\) - DIAGNOSTIC CODE INDEX](#) .
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

No

- Replace the ABS Module in accordance with the Service Information. Refer to [MODULE, ANTI-LOCK BRAKE SYSTEM \(ABS\), REMOVAL AND INSTALLATION](#) .
- Perform the ABS VERIFICATION TEST. Refer to [ABS VERIFICATION TEST](#) .

U11B9-00-LOST COMMUNICATION WITH RF HUB

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [COMMUNICATION DIAGNOSTIC PROCEDURE](#) .

U11BF-00-LOST BRAKE PEDAL POSITION MESSAGE

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 11.0 volts.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive the Brake Pedal Position Sensor message over the CAN C bus from the Anti-Lock Brake System (ABS) Module.

DEFAULT ACTION

- MIL light will illuminate.

POSSIBLE CAUSES

Possible Causes
BRAKE PEDAL POSITION SENSOR WIRING ISSUES
BRAKE PEDAL POSITION SENSOR
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ANTI-LOCK BRAKE MODULE FOR BPP SENSOR FAULTS

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against a BPP Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

No

- Replace the ABS Module in accordance with the Service Information. Refer to **MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

U11DE-LOST SPEED CONTROL MESSAGE

WHEN MONITORED

- This diagnostic runs continuously when the Speed Control system is active.

SET CONDITION

- The Powertrain Control Module (PCM) does not receive a Speed Control message from the Steering Column Control Module (SCCM) over the CAN Bus.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
LIN BUS OPEN OR SHORTED TO GROUND
SPEED CONTROL SWITCH ASSEMBLY
STEERING COLUMN CONTROL MODULE (SCCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK COMMUNICATION BETWEEN THE SCCM AND THE SPEED CONTROL SWITCH ASSEMBLY

1. Turn the ignition on.
2. With the scan tool, read DTCs in the SCCM.

Is the SCCM reporting any Speed Control Switch or a Loss of Communication fault with the Speed Control Switch Assembly?

Yes

- Refer to - DTC-Based Diagnostics/MODULE, Steering Column Control Module (SCCM)/Diagnosis and Testing, and perform the appropriate diagnostic test.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [2](#)

2. CHECK FOR AN ACTIVE DTC

1. Cycle the ignition off and back to on.
2. With the scan tool, read active DTCs.

Is this DTC active?

Yes

- Go To [3](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

3. CHECK THE PCM FOR OTHER COMMUNICATION DTCS

1. With the scan tool continue reading PCM DTCs.

Is the PCM reporting any other Lost Messages or Implausible Data DTCs?

Yes

- Go To [4](#)

No

- Wiggle test and check the connector at the SCCM for an intermittent loose connection. If the wiring and connector tests good, replace and program the Steering Column Control Module (SCCM) in accordance with the Service Information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U120C-00-LOST BRAKE BOOSTER SIGNAL

WHEN MONITORED

- This diagnostic runs continuously with the Ignition on.

SET CONDITION

- The Powertrain Control Module (PCM) doesn't receive a brake booster vacuum signal from the Anti-lock Brake System (ABS) Module over the CAN C bus.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
BRAKE BOOSTER PRESSURE SENSOR WIRING ISSUES
BRAKE BOOSTER PRESSURE SENSOR
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, read DTCS.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. ABS COMMUNICATION RELATED DTCS IN OTHER MODULES

1. With the scan tool, read DTCs in the ABS Module.

Is the ABS Module setting any DTCs against the Brake Booster Pressure Sensor?

Yes

- Perform the diagnostic procedure in the ABS Module. Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

No

- Replace the ABS Module in accordance with the Service Information. Refer to **MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

U12A3-00-LOST COMMUNICATION WITH PM SENSOR

For a complete DIESEL EXHAUST FLUID DEF SYSTEM wiring diagram, refer to the appropriate wiring information .

WHEN MONITORED

Continuously with the ignition on.

SET CONDITION

The Powertrain Control Module (PCM) does not receive a message from the Particulate Matter Sensor over the Datalink circuits.

POSSIBLE CAUSES

Possible Causes
LOW BATTERY VOLTAGE
FUSED IGNITION SWITCH CIRCUIT OPEN/HIGH RESISTANCE
FUSED IGNITION SWITCH CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
LOW DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
HIGH DATALINK (+) CIRCUIT SHORT TO VOLTAGE
LOW DATALINK (-) CIRCUIT SHORT TO VOLTAGE
HIGH DATALINK (+) CIRCUIT SHORT TO GROUND
LOW DATALINK (-) CIRCUIT SHORT TO GROUND
NOX SENSOR 1/1
NOX SENSOR 1/2
PARTICULATE MATTER (PM) SENSOR
DEF HEATER CONTROL UNIT
POWERTRAIN CONTROL MODULE (PCM)

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, read DTCs.

Is this DTC active?

Yes

- Go To [2](#)

No

- Perform to the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any P05F3 or P05F5 DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** .

No

- Go To [3](#)

3. CHECK THE BATTERIES AND CHARGING SYSTEM FOR PROPER VOLTAGE AND OPERATION

1. Check the Batteries and charging system for proper system voltage and operation.

Are the Batteries and charging system operating correctly and producing the proper system voltage?

Yes

- Go To [4](#)

No

- Diagnose and repair the Batteries and charging system before continuing.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

4. CHECK FOR OTHER DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The Datalinks are BUS circuits which the PCM uses to communicate with the Particulate Matter Sensor, DEF Heating Control Unit, NOx Sensor 1/1 and Nox Sensor 1/2. If a Datalink circuit is shorted or one of these components is internally shorted, communication will be lost and DTCs will set against ALL of these components.

Are there lost communication DTCs present against any components (other than Particulate Matter Sensor) listed in the note above?

Yes

- Go To [9](#)

No

- Go To [5](#)

5. CHECK THE FUSED IGNITION SWITCH CIRCUIT AND THE PARTICULATE MATTER SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [6](#)

No

- Repair the Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [7](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C2 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Replace the Particulate Matter Sensor in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

9. CHECK THE COMPONENTS ON THE DATALINK CIRCUITS FOR PROPER OPERATION

NOTE: Disconnect only one component at a time during this next step. If the DTCs for the components that are **STILL CONNECTED** change from active to stored, the component that was disconnected is faulty. If all of the DTCs remain active, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.

1. Turn the ignition off.
2. Reconnect all four components connected to the Datalink circuits.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Turn the ignition off.
6. Disconnect the Particulate Matter Sensor harness connector. Cycle the ignition key on and off the three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

7. Turn the ignition off and reconnect the Particulate Matter Sensor harness connector.
8. Disconnect the NOx Sensor Module 1/1 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

9. Turn the ignition off and reconnect the NOx Sensor Module 1/1 harness connector.
10. Disconnect the NOx Sensor Module 1/2 harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

11. Turn the ignition off and reconnect the NOx Sensor Module 1/2 harness connector.
12. Disconnect the DEF Heater Control Unit harness connector. Cycle the ignition key on and off three times ending with the ignition on. Leave the ignition in the off position for 75 seconds each time.

NOTE: Monitor the status of the DTCs for the remaining connected components with the scan tool.

Did the status of the DTCs change to stored for the components **STILL CONNECTED** when disconnecting any one of the components listed above?

Yes

- Replace the component that caused the DTC change from active to stored in accordance with the service information.

- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [10](#)

10. CHECK THE (F204) FUSED IGNITION SWITCH CIRCUIT AND THE NOX SENSOR 1/1 GROUND CIRCUIT FOR A SHORT TO GROUND OR AN OPEN/HIGH RESISTANCE

1. Turn the engine off.
2. Disconnect the Particulate Matter Sensor (vehicle harness) harness connector.
3. Turn the ignition on, engine off.
4. Measure the voltage across the (F204) Fused Ignition Switch circuit and the Particulate Matter Sensor Ground circuit at the Particulate Matter Sensor (vehicle harness) harness connector.

Does the voltage read within 1.0 Volt of battery voltage?

Yes

- Go To [11](#)

No

- Repair the (F204) Fused Ignition Switch circuit for an open or short to ground, or check the Particulate Matter Sensor Ground circuit for an open.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

11. CHECK THE DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Measure the resistance between ground and the (D469) High Datalink (+) circuit at the PCM C1 harness connector.
4. Measure the resistance between ground and the (D468) Low Datalink (-) circuit at the PCM C1 harness connector.

Is the resistance above 10k Ohms for both circuits?

Yes

- Go To [12](#)

No

- Repair the Datalink circuit that did not measure above 10k Ohms for a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

12. CHECK THE DATALINK CIRCUITS FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D469) High Datalink (+) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit between the Particulate Matter Sensor harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms for either circuit?

Yes

- Repair the Datalink circuit that measured above 5.0 Ohms for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Go To [13](#)

13. CHECK THE DATALINK CIRCUITS FOR A SHORT TO VOLTAGE

1. Measure the resistance of the (D469) High Datalink (+) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.
2. Measure the resistance of the (D468) Low Datalink (-) circuit to all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

NOTE: Disregard any resistance between 50 and 70 Ohms between the (D469) High Datalink (+) and the (D468) Low Datalink (-) pins.

Is the resistance above 10k Ohms for both measurements?

Yes

- Go To [14](#)

No

- Repair the Datalink circuit for a short to the circuit that did not measure above 10k Ohms.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

14. CHECK THE PARTICULATE MATTER SENSOR FOR PROPER OPERATION

The Particulate Matter Sensor consists of a Module and a Probe (with a harness in between) which cannot be serviced separately. They are replaced as one unit.

1. Replace the Particulate Matter Sensor in accordance with the service information.
2. Reconnect the Particulate Matter Sensor, NOx Sensor Modules, DEF Heater Control Unit, and the PCM C1 harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase PCM DTCs.
5. Start the engine and run it until it reaches operating temperature.
6. Test drive the vehicle under normal operating conditions.

NOTE: During cold ambient temperatures, it may be necessary to test drive the vehicle for an extended period to properly cycle the fail conditions for this DTC.

7. With the scan tool, read PCM DTCs.

Does the scan tool display this DTC?

Yes

- Go To [15](#)

No

- Test complete.

- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

15. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

U12A8-00-LOST COMMUNICATION WITH MASTER CYLINDER PRESSURE SENSOR

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.
- Battery voltage above 11.0 volts.

SET CONDITION

- The Master Cylinder Pressure Sensor signal is determined to be invalid by the Anti-Lock Brake System (ABS) Module.

DEFAULT ACTION

- The MIL will illuminate.

POSSIBLE CAUSES

Possible Causes
HYDRAULIC CONTROL UNIT (HCU) INTEGRATED CONTROL UNIT (ICU) ANTI-LOCK BRAKE SYSTEM (ABS) MODULE

Always perform the **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With the scan tool, read DTCs and record on the repair order.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to **INTERMITTENT DTC** .

2. CHECK THE ABS MODULE FOR DTCS

1. With the scan tool, read DTCs in the ABS Module.

Are there any DTCs in the ABS Module?

Yes

- Perform the diagnostic procedure for the DTC in the ABS Module. Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

No

- Replace the ABS Module in accordance with the Service Information. Refer to **MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION** .
- Perform the ABS VERIFICATION TEST. Refer to **ABS VERIFICATION TEST** .

U1431-00-IMPLAUSIBLE ACC TORQUE MESSAGE RECEIVED

WHEN MONITORED

With the ignition on, battery voltage between 9 and 16 volts, and engine run time greater than three seconds.

SET CONDITION

The Powertrain Control Module (PCM) either doesn't receive a bus message or receives an implausible bus message from the Adaptive Cruise Control (ACC) Module.

POSSIBLE CAUSES

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
NO POWER TO ACC MODULE - MODULE UNPLUGGED OR OPEN FUSE
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#).

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red. Selecting any of the network components allows access to the source of the problem.

1. Start the engine and allow it to reach operating temperature.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in possible serious or fatal injury.

2. With a scan tool, select View DTCs.

Is the status active or pending for this DTC?

Yes

- Refer to - DTC-Based Diagnostics/MODULE, Adaptive Cruise Control Module (ACCM)-Diagnosis and Testing, for diagnostic procedures and for further possible causes.

No

- Refer to [STORED LOST COMMUNICATION DTCS](#) and perform the Stored Lost Communication DTCs diagnostic procedure.

U1432-00-IMPLAUSIBLE CABIN TEMPERATURE SIGNAL RECEIVED

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- Vehicle is being driven.

SET CONDITION

- The Powertrain Control Module (PCM) detects an implausible cabin heater message from the Body Control Module (BCM), or loss of communication over the BUS.

DEFAULT ACTION

- This is a non-MIL fault.

POSSIBLE CAUSES

Possible Causes
CAN BUS OPEN OR SHORTED CONDITION
BODY CONTROL MODULE (BCM)
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to [PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#) .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With a scan tool, view DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT DTC diagnostic procedure.. Refer to [INTERMITTENT DTC](#) .

2. CHECK FOR OTHER DTCS

1. Refer to the recorded DTCs.

Are there any CAN B and C communication DTCs or HVAC DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) .

No

- Go To [3](#)

3. CHECK FOR ANY BCM COMMUNICATION RELATED DTCs IN OTHER MODULES

1. With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the BCM at this time?

Yes

- Replace the BCM in accordance with the service information.
- Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .

No

- Go To [4](#)

4. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.
 - Weather seal damage (if equipped).
 - Bent terminals.
 - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
 - Terminals that have been pushed back into the connector cavity.
 - Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

U144F-00-ACTIVE GRILL SHUTTER MODULE 1 RECEIVED IMPLAUSIBLE DATA FROM PCM WHEN MONITORED

With the ignition on. Continuously when the system is active.

SET CONDITION

The Powertrain Control Module (PCM) doesn't receive a Bus Message from the Active Grill Shutter Module for 2.0 seconds. This is a two Trip Fault.

POSSIBLE CAUSES

Possible Causes
GENERATOR
GLOW PLUG MODULE
LIN BUS CIRCUIT SHORTED TO GROUND
LIN BUS CIRCUIT OPEN/HIGH RESISTANCE
LIN BUS CIRCUIT SHORTED TO VOLTAGE
FUSED B+ SUPPLY CIRCUIT OPEN/HIGH RESISTANCE
FUSED B+ SUPPLY CIRCUIT SHORT TO GROUND
GROUND CIRCUIT OPEN/HIGH RESISTANCE
ACTIVE GRILL SHUTTER ASSEMBLY
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE** .

DIAGNOSTIC TEST

1. CHECK FOR AN ACTIVE DIAGNOSTIC TEST CODE (DTC)

1. Ignition on, engine not running.
2. With the scan tool, erase DTCs in the PCM.
3. Turn the ignition off. Leave the ignition off for 5 minutes.
4. Start the engine.
5. Allow the engine to run for 2 minutes.
6. With the scan tool, select View DTCs.

Is the status Active for this DTC?

Yes

- Go To [2](#)

No

- Perform the Stored Lost Communication DTCs diagnostic procedure. Refer to **STORED LOST COMMUNICATION DTCS** .

2. INSPECT THE ACTIVE GRILL SHUTTER ASSEMBLY FOR SIGNS OF PHYSICAL DAMAGE

1. Inspect the Active Grill Shutter Assembly and connector for damage due to road debris.

Is the Active Grill Shutter Assembly or connector damaged or disconnected?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Go To [3](#)

3. CHECK THE GENERATOR FOR PROPER OPERATION

1. Turn the ignition off. Leave it off for 5 minutes.
2. Disconnect the Generator Module harness connector.

3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Crank the engine for no more than 10 seconds if it will not start.
6. With the scan tool, select View DTCs.

Does the DTC become active?

Yes

- Go To [4](#)

No

- Replace the Generator in accordance with the service information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. CHECK THE GLOW PLUG MODULE FOR PROPER OPERATION

1. Turn the ignition off. Leave it off for 5 minutes.
2. Disconnect the Glow Plug Module harness connector.
3. Ignition on, engine not running.
4. With the scan tool, erase DTCs in the PCM.
5. Crank the engine for no more than 10 seconds if it will not start.
6. With the scan tool, select View DTCs.

Does the DTC become active?

Yes

- Go To [5](#)

No

- Replace the Glow Plug Module in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

5. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO OTHER CIRCUITS IN THE PCM C1 HARNESS CONNECTOR

1. Turn the ignition off.
2. Disconnect the Glow Plug Module harness connector.
3. Disconnect the PCM C1 harness connector.
4. Measure the resistance between the (D511) LIN Bus circuit and all other circuits on the PCM C1 harness connector at the PCM C1 harness connector.

Is the resistance above 10k Ohms on all other circuits?

Yes

- Go To [6](#)

No

- Repair the (D511) LIN Bus circuit for a short to the circuit that measured less than 10k Ohms.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

6. CHECK THE (D511) LIN BUS CIRCUIT FOR A SHORT TO GROUND

1. Measure the resistance between ground and the (D511) LIN Bus circuit at the Glow Plug Module harness connector.

Is the resistance above 10k Ohms?

Yes

- Go To [7](#)

No

- Repair the (D511) LIN Bus circuit for a short to ground.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

7. CHECK THE (D511) LIN BUS CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance of the (D511) LIN Bus circuit between the Glow Plug Module harness connector and the PCM C1 harness connector.

Is the resistance above 5.0 Ohms?

Yes

- Repair the (D511) LIN Bus circuit for an open/high resistance.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Go To [8](#)

8. CHECK THE (A940) FUSED B+ CIRCUIT FOR PROPER VOLTAGE

1. Turn the ignition off.
2. Disconnect the AGS harness connector.
3. Measure the voltage at the (A940) Fused B+ circuit at the AGS harness connector.

NOTE: **The (A940) Fused B+ circuit is supplied to two terminals at the AGS Assembly. Be sure to check both circuits.**

Is the voltage equal to battery voltage?

Yes

- Go To [9](#)

No

- Repair the (A940) Fused B+ circuit for an open or short to ground.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

9. CHECK THE (Z904) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE

1. Measure the resistance between ground and the (Z904) Ground circuit at the AGS harness connector.

Is the resistance below 5.0 Ohms?

Yes

- Go To [10](#)

No

- Repair the (Z904) Ground circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

10. CHECK FOR DAMAGED WIRES OR DAMAGED TERMINALS

1. Turn the ignition off.
2. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the Glow Plug Module and the PCM.
3. Look for any chafed, pierced, pinched, or partially broken wires.
4. Look for broken, bent, pushed out or corroded terminals.

Were any problems found?

Yes

- Repair as necessary.
- Perform the PCM VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

No

- Go To [11](#)

11. CHECK THE ACTIVE GRILL SHUTTER ASSEMBLY FOR PROPER OPERATION

1. Replace the Active Grill Shutter Assembly in accordance with the service information. Navigate to Miscellaneous functions and perform the 'Active Grille Shutter Replaced' procedure.
2. Reconnect the PCM C1 harness connector.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. With the scan tool, actuate the AGS Assembly.
6. With the scan tool, view DTCs.

Did the DTC return?

Yes

- Go To [12](#)

No

- Repair complete.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#) .

12. CHECK RELATED HARNESS CONNECTIONS

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
 - Proper connector installation.
 - Damaged connector locks.
 - Corrosion.
 - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Check for spread terminals and verify proper terminal tension.

Repair any conditions that are found.

5. Connect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
10. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

No

- Repair the poor connections.
- Perform the POWERTRAIN VERIFICATION TEST. Refer to [**PCM VERIFICATION TEST**](#).

U1489-00-IMPLAUSIBLE DATA RECEIVED FROM RF HUB

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to [**COMMUNICATION DIAGNOSTIC PROCEDURE**](#).

U3017-00-CONTROL MODULE TIMER-CLOCK PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously with the engine running provided the block heater is not detected and power-down coolant temperature is greater than or equal to 71.95B° C (161.51B° F).

SET CONDITION

The BCM engine ignition off time is too high or low for the coolant temperature drop observed over the key cycle.

POSSIBLE CAUSES

Possible Causes
(RECENTLY) REPROGRAMMED POWERTRAIN CONTROL MODULE (PCM)
(RECENTLY) REPROGRAMMED BODY CONTROL MODULE (BCM)

Possible Causes
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
BODY CONTROL MODULE (BCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. Refer to **[PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE](#)**.

DIAGNOSTIC TEST

1. ACTIVE DTC

NOTE: If you see this DTC after the BCM or PCM module has been reflashed, clear the DTC and test drive the vehicle.

NOTE: If there are any coolant temperature sensor DTC's present, perform the Diagnostics for those DTCs before continuing with this one.

1. Ignition on, start the engine.
2. With a scan tool read DTCs.

Is the DTC active or pending at this time?

Yes

- This DTC can be caused by disconnecting the Battery before allowing the normal 10 minute power down. Clear the DTC and test drive.
- Perform the PCM VERIFICATION TEST. Refer to **[PCM VERIFICATION TEST](#)**.

No

- Go To [2](#)

2. CHECK FOR A (RECENTLY) REPROGRAMMED CONTROL MODULE

Were the PCM or BCM recently Reprogrammed?

Yes

- This fault has the potential to set if the PCM or BCM are reprogrammed. Clear the DTC and test drive.
- Perform the PCM VERIFICATION TEST. Refer to **[PCM VERIFICATION TEST](#)**.

No

- Go To [3](#)

3. CHECK THE ECT SENSOR VALUE

1. Remove the ECT Sensor and reconnect the wiring to the sensor.
2. Turn ignition on.
3. Monitor the Scan Tool while heating the sensor with an external heat source (DO NOT USE OPEN FLAME).

Does the reading from the ECT Sensor increase at least 3B°C (5B°F) on the Scan Tool?

Yes

- Go To [4](#)

No

- Replace the Engine Coolant Temperature (ECT) Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

4. COMPARE THE ENGINE COOLANT TEMPERATURE SENSOR VALUE TO OTHER TEMPERATURE SENSORS

1. Let vehicle cold soak for eight hours.
2. Turn the ignition on.
3. With a scan tool, monitor the Ambient Air Temperature Sensor, the Turbo Compressor Inlet Temperature Sensor, and the ECT Sensor.

NOTE: Make sure the Ambient Air Temperature is above -7B°C (20B°F).

NOTE: Make sure there is no external heat source, such as a block heater, operating during this test or within the 8 hour cold soak.

Does the ECT Sensor read more than a 10B°C (18B°F) above or below the other sensors?

Yes

- Replace the Engine Coolant Temperature (ECT) Sensor in accordance with the Service Information.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#) .

No

- Replace the Body Control Module (BCM) in accordance with the Service Information.
 - Perform the BODY VERIFICATION TEST. Refer to [BODY VERIFICATION TEST](#) .
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2021 AUTOMATIC TRANSMISSION

3.0L Diesel - Intermittent Condition, PCM Verification Test & Pre-Diagnostic Troubleshooting Procedure - Gladiator [EXJ]

STANDARD PROCEDURE

INTERMITTENT DTC

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

DIAGNOSTIC TEST

INTERMITTENT DTC

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in possible serious or fatal injury.

1. The conditions necessary to set this DTC are not present at this time.
2. Review the scan tool environmental data. If possible, try to duplicate the conditions under which the DTC set.
3. If applicable, actuate the component with the scan tool.
4. Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
5. Look for the data to change, the actuation to be interrupted, or for the DTC to reset during the wiggle test.
6. Perform any Technical Service Bulletins (TSBs) that may apply.
7. Turn the ignition off.
8. Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.
9. Perform a voltage drop test on the related circuits between the suspected component and the PCM.
10. Inspect and clean all Powertrain Control Module (PCM), engine, and chassis grounds that are related to the most current DTC.
11. If numerous trouble codes were set, use a schematic and inspect any common ground or supply circuits.
12. For intermittent Misfire DTCs check for restrictions in the intake and exhaust system, proper installation of sensors, vacuum leaks, and binding components that are run by the accessory drive belt.
13. Use the scan tool to perform a System Test if one applies to the component.
14. A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

Were any problems found during the above inspections?

Yes

- Perform the necessary repairs.
- Perform the PCM VERIFICATION TEST. Refer to **PCM VERIFICATION TEST** .

No

- Test Complete.

PCM VERIFICATION TEST

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

DIAGNOSTIC TEST

1. SELECT THE PROPER VERIFICATION TEST

Select the verification test for the repair that has been completed:

For a Speed Control repair

- Go To [2](#)

For a Charging System repair

- Go To [3](#)

For a No Start repair

- Go To [4](#)

For DTC and all other repairs

- Go To [5](#)

2. SPEED CONTROL VERIFICATION TEST

1. Inspect the vehicle to make sure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. With the scan tool, erase all DTCs.
3. Road test the vehicle at a speed above 60 km/h (35 MPH).
4. Turn the speed control ON/OFF switch on.
5. Depress and release the SET switch. If the speed control does not engage, the repair is not complete, continue with step 12.
6. Quickly depress and release the RESUME/ACCEL switch. If the vehicle speed does not increase by 3 km/h (2 MPH), the repair is not complete, continue with step 12.
7. Using caution, depress and release the brake pedal. If the speed control does not disengage, the repair is not complete, continue with step 12.
8. With the vehicle speed at least 60 km/h (35 MPH), depress the RESUME/ACCEL switch. If the speed control does not resume at the previously set speed, the repair is not complete, continue with step 12.
9. Hold down the COAST switch. If the vehicle does not decelerate, the repair is not complete, continue with step 12.
10. While still holding down the COAST switch, make sure the vehicle speed is at least 60 km/h (35 MPH) and release the COAST switch. If the vehicle does not adjust and set a new vehicle speed, the repair is not complete, continue with step 12.
11. With the speed control engaged, depress the ON/OFF switch. If the speed control does not disengage, the repair is not complete, continue with step 12.
12. If the vehicle did not successfully perform all of the previous steps, perform any Technical Service Bulletins (TSBs) that may relate to this condition, if necessary, return to the DTC List.
13. If the vehicle successfully performed all of the previous steps, the speed control system is now functioning as designed. The repair is now complete.

Are any DTCs or symptoms remaining?

Yes

- Repair is not complete, perform the appropriate diagnostic procedure.

No

- Repair is complete.

3. CHARGING SYSTEM VERIFICATION TEST

1. Inspect the vehicle to make sure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. With the scan tool, erase all DTCs.
3. Start the engine.
4. Raise the engine speed to 2000 RPM for at least 30 seconds.
5. Allow the engine to idle.
6. Turn the ignition off for 20 seconds.
7. Turn the ignition on.
8. With the scan tool, read PCM DTCs.
9. If this DTC has set again, or another DTC has set, perform any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the DTC List if necessary.
10. If the charging system is functioning correctly and there are no DTCs, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes

- Repair is not complete, perform the appropriate diagnostic procedure.

No

- Repair is complete.

4. NO START VERIFICATION TEST

NOTE: **IMPORTANT! If the Wireless Control Module/Wireless Ignition Node has been replaced, make sure the programming procedure for the module has been performed in accordance with the service information.**

NOTE: **If the Powertrain Control Module (PCM) has been replaced, Go to the PCM/PCM REPROGRAMMING - DIESEL document, and perform the necessary routines. Refer to the appropriate information.**

1. Inspect the vehicle to make sure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. Inspect the engine oil for contamination. If it is contaminated, change the oil and filter.
3. With the scan tool, erase all DTCs.
4. Turn the ignition off for at least 10 seconds.
5. Attempt to start the engine.
6. If the engine is unable to start, perform any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the DTC List if necessary.
7. If the engine starts and continues to run, the repair is now complete.

Are any DTCs or symptoms remaining?

Yes

- Repair is not complete, perform the appropriate diagnostic procedure.

No

- Repair is complete.

5. DTC-ROAD TEST VERIFICATION TEST

1. Inspect the vehicle to make sure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.
2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. If not, proceed to step 5.
3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete.
4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the DTC List if necessary.
5. For previously read DTCs that have not been dealt with, return to the DTC List and follow the diagnostic path for that DTC; otherwise, continue to step 6.
6. If the Powertrain Control Module (PCM) has been replaced, Go to the PCM/PCM REPROGRAMMING - DIESEL document, and perform the necessary routines. Refer to the appropriate information . Then continue to step 7.
7. If equipped with a Transfer Case Position Switch, perform step 8, otherwise, continue with step 9.
8. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position.
9. With the scan tool, erase all diagnostic trouble codes (DTCs).
10. Road test the vehicle. Drive the vehicle under various driving conditions. Attempt to duplicate the conditions in the Freeze Frame Data under which the DTC was set if possible. If this test is for an A/C Relay Control Circuit, drive the vehicle for at least five minutes with the A/C on.
11. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue driving.
12. Upon completion of the road test, check for DTCs with the scan tool.
13. If the repaired DTC has returned, the repair is not complete. Check for any related Technical Service Bulletins (TSBs) and return to the DTC List. If there are no DTCs, the repair was successful and is now complete.

Are any DTCs or symptoms remaining?

Yes

- Repair is not complete, perform the appropriate diagnostic procedure.

No

- Repair is complete.

PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For a complete wiring diagram, refer to appropriate **SYSTEM WIRING DIAGRAMS** article .

DIAGNOSTIC TEST

1. ELECTRICAL CONNECTOR INSPECTION

NOTE: The issues discussed in this Pre-Diagnostic Troubleshooting Procedure are many times related to a poor connection.

1. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors between the component and the module.

NOTE: Pay particular attention to connectors close to the suspect device(s) within the system being tested.

2. Verify that the connector(s) is seated properly in its locked position.
3. Disconnect and visually inspect the connector(s) looking for corrosion, bent, pushed out, or otherwise damaged terminals and pins.
4. Repair any damage found as needed.
5. Reconnect the connector(s).
6. Attempt to duplicate the environmental conditions that created the customer's concern.

Did the customer's concern return?

Yes

- Go To [2](#)

No

- Test Complete.
- Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** and perform the appropriate diagnostic procedure.

2. NO RESPONSE

NOTE: For vehicle communication problems, use the scan tool to refer to the Network Review Screen. The screen depicts a high level view of the vehicle network. Fault and problem areas appear in red.

Does the scan tool display a Vehicle Network problem or NO RESPONSE condition?

Yes

- Refer to **DIAGNOSIS AND TESTING** and perform the appropriate No Response diagnostic procedure.

No

- Go To [3](#)

3. NO START

Does the vehicle have a NO START condition?

Yes

- Check the vehicle for any DTCs, including Vehicle Theft Security related DTCs, which may cause a no-start condition.
- If no DTCs are present that relate to a no-start condition, for procedures related to Fuel and Starting systems. Refer to **DIAGNOSIS AND TESTING**.

No

- Go To [4](#)

4. VEHICLE REPAIR HISTORY AND TSB(s)

1. Check the vehicle repair history for repairs that may relate to the current condition.
2. Inspect the vehicle for aftermarket accessories that may have been installed incorrectly.
3. Check for any Technical Service Bulletins (TSBs) related to the condition or DTCs.
4. If a TSB applies, follow the procedure outlined in the TSB.

Select the appropriate response for the condition that applies:

Performing a TSB procedure repaired the condition.

- Test Complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

A DTC is present, no TSB applies, or the TSB didn't repair the condition.

- Go To [5](#)

No DTCs or conditions are present.

- Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) and perform the INTERMITTENT DTC diagnostic procedure.

5. VEHICLE INSPECTION

NOTE: The issues discussed in this Test Step are many times related to a poor connection. Pay particular attention to connectors close to the suspect device(s) within the system being tested. If a connector is found to be a possible cause of the condition, repair as necessary and retest.

1. Based on the diagnostic condition that applies, review the following list and perform any tests that relate to the condition:
 - If multiple DTCs are set in the PCM, review the wiring schematics for problems in any shared supply or ground circuits. and perform the CHECKING THE PCM POWER AND GROUND CIRCUITS diagnostic procedure. Refer to the appropriate diagnostic information.
 - Inspect the air intake system and turbocharger related tubes for damage, restrictions, or poor connections.
 - Inspect the exhaust system and related tubes for damage, restrictions, or poor connections.
 - Remove and inspect the Air Filter for soiling or excessive dirt and debris which may cause an air flow restriction.
 - If the PCM detects and stores a DTC, the PCM also stores the environmental conditions under which the DTC was set.
 - Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.
2. Using the scan tool, Clear the stored DTCs.
3. Attempt to duplicate the environmental conditions under which the DTC was set.
4. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the vehicle conditions under which the DTC conditions will be monitored. Operate the vehicle under those conditions.
5. Using the appropriate wiring diagram/schematic as a guide, inspect the wiring and connectors between the component and the module.
6. If the DTCs are fuel or air handling system related, check the fuel level and quality.

Were any repairs made that corrected the DTC or condition?

Yes

- Test complete.
- Perform the PCM VERIFICATION TEST. Refer to [PCM VERIFICATION TEST](#).

No

- Refer to [3.0L DIESEL - DIAGNOSTIC CODE INDEX](#) and perform the appropriate diagnostic procedure.

