

# **GENERAL DESCRIPTION**

# List of Diagnostic Trouble Code (DTC)

## GENERAL DESCRIPTION

# 1. List of Diagnostic Trouble Code (DTC)

## A: LIST

DTC	Item	Index
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(STi)-9, DTC P0011 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(STi)-11, DTC P0021 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(STi)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(STi)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(STi)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(STi)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(STi)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF – Throttle Position Correlation	<Ref. to GD(STi)-21, DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(STi)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(STi)-26, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(STi)-28, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(STi)-30, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(STi)-32, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(STi)-34, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(STi)-36, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(STi)-38, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(STi)-40, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(STi)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	<Ref. to GD(STi)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	<Ref. to GD(STi)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(STi)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(STi)-50, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(STi)-52, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(STi)-54, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(STi)-56, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(STi)-58, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(STi)-61, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(STi)-63, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(STi)-65, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(STi)-67, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(STi)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(STi)-75, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(STi)-78, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(STi)-81, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(STi)-83, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	<Ref. to GD(STi)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	<Ref. to GD(STi)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(STi)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(STi)-91, DTC P0244 TURBO/SUPER CHARGER WASTE-GATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to GD(STi)-93, DTC P0245 TURBO/SUPER CHARGER WASTE-GATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to GD(STi)-95, DTC P0246 TURBO/SUPER CHARGER WASTE-GATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(STi)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0302	Cylinder 2 misfire detected	<Ref. to GD(STi)-102, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(STi)-102, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(STi)-102, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(STi)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(STi)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(STi)-107, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(STi)-109, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(STi)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to GD(STi)-112, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(STi)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(STi)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(STi)-141, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(STi)-143, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(STi)-145, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(STi)-147, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(STi)-149, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(STi)-150, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to GD(STi)-150, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(STi)-151, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(STi)-153, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(STi)-155, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(STi)-157, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(STi)-159, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(STi)-161, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(STi)-164, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(STi)-166, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(STi)-168, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(STi)-170, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(STi)-172, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(STi)-174, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(STi)-176, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(STi)-178, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(STi)-180, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(STi)-181, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(STi)-184, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(STi)-187, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(STi)-188, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(STi)-189, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(STi)-190, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(STi)-191, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(STi)-194, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(STi)-197, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(STi)-199, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(STi)-201, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(STi)-202, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(STi)-203, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(STi)-205, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(STi)-207, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(STi)-210, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(STi)-212, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(STi)-213, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(STi)-214, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(STi)-214, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(STi)-214, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(STi)-214, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(STi)-214, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(STi)-214, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(STi)-214, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(STi)-215, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(STi)-216, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(STi)-217, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(STi)-218, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(STi)-219, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(STi)-221, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(STi)-223, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(STi)-225, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	<Ref. to GD(STi)-227, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 1)	<Ref. to GD(STi)-229, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 2)	<Ref. to GD(STi)-231, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 2)	<Ref. to GD(STi)-233, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(STi)-235, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(STi)-237, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(STi)-239, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to GD(STi)-241, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(STi)-243, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(STi)-245, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(STi)-247, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(STi)-249, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(STi)-251, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to GD(STi)-253, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	<Ref. to GD(STi)-255, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	<Ref. to GD(STi)-257, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<Ref. to GD(STi)-259, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<Ref. to GD(STi)-261, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch "A"/"B" Voltage Rationality	<Ref. to GD(STi)-263, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Rationality	<Ref. to GD(STi)-265, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/ Performance	<Ref. to GD(STi)-267, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

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DTC	Item	Index
P2228	Barometric Pressure Circuit Low Input	<Ref. to GD(STi)-268, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High Input	<Ref. to GD(STi)-269, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

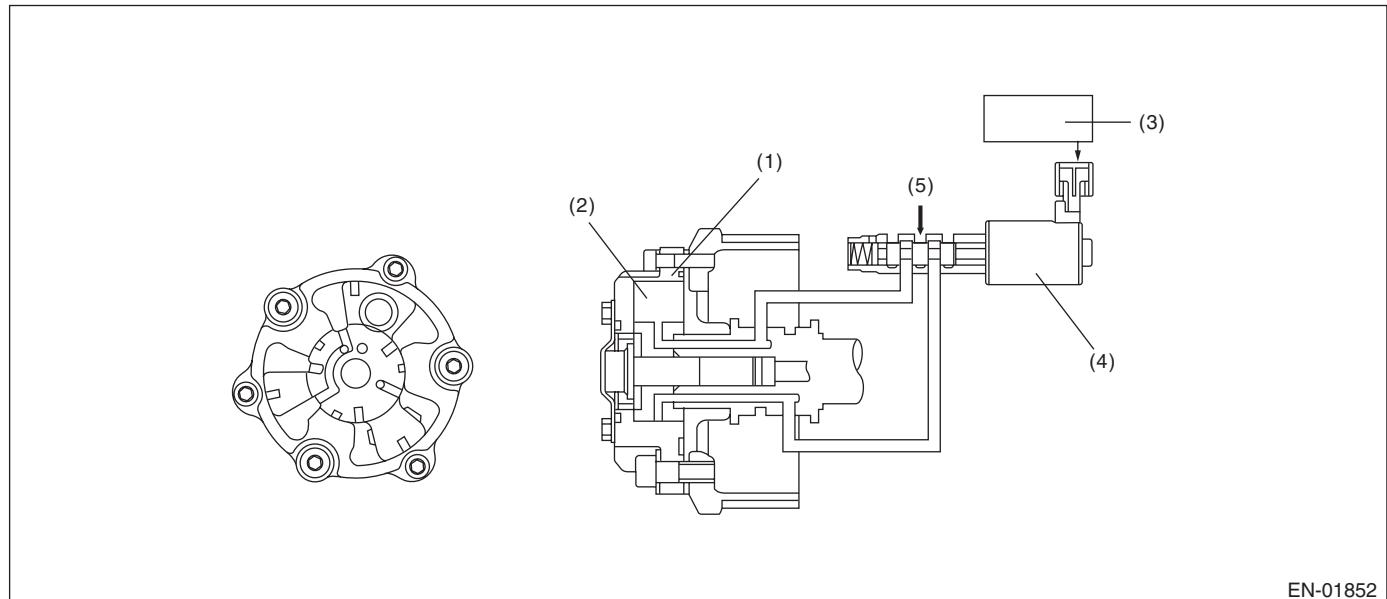
### A: DTC P0011 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

#### 2. COMPONENT DESCRIPTION



- (1) AVCS timing controller
- (2) Vane
- (3) Engine control module (ECM)
- (4) Oil flow control valve
- (5) Oil pressure

#### 3. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Engine speed	$\geq 600$ rpm
Engine coolant temperature	$\geq 60^{\circ}\text{C}$
Amount of AVCS target timing advance	$= 0^{\circ}\text{CA}$

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after idling when the amount of AVCS target timing advance is equal to 0.

#### 5. DIAGNOSTIC METHOD

Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large, and judge OK when the difference becomes small.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position – AVCS actual position	$\geq 20^\circ$

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
AVCS control	During feedback
Amount of AVCS target timing advance	5 — $30^\circ$ CA
AVCS target position – AVCS actual position	$< 10^\circ$

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value ( $0^\circ$ CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value ( $0^\circ$ CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### B: DTC P0021 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STi)-9, DTC P0011 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

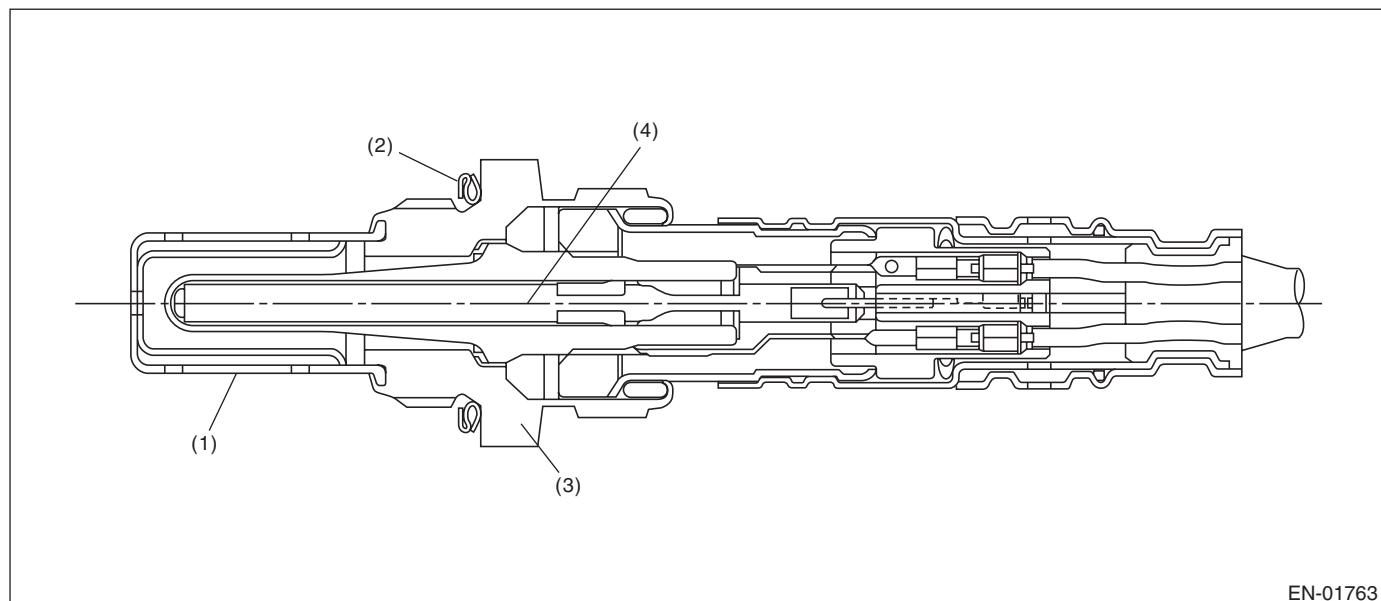
### C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

#### 2. COMPONENT DESCRIPTION



- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more
Front oxygen (A/F) sensor heater control duty $\geq$ 70%	Experienced

#### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

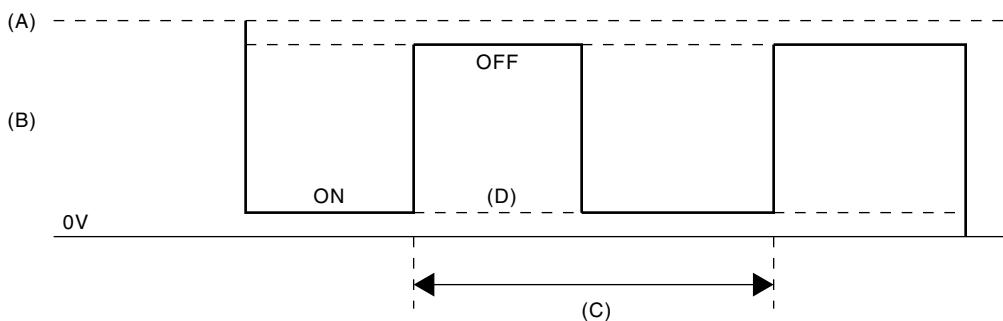
Memorize the freeze frame data. (For test mode \$02)

**D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

**2. COMPONENT DESCRIPTION**

EN-01792

- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) Low abnormality

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

**4. GENERAL DRIVING CYCLE**

Always perform diagnosis continuously.

**5. DIAGNOSTIC METHOD**

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	$< 87.5\%$

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

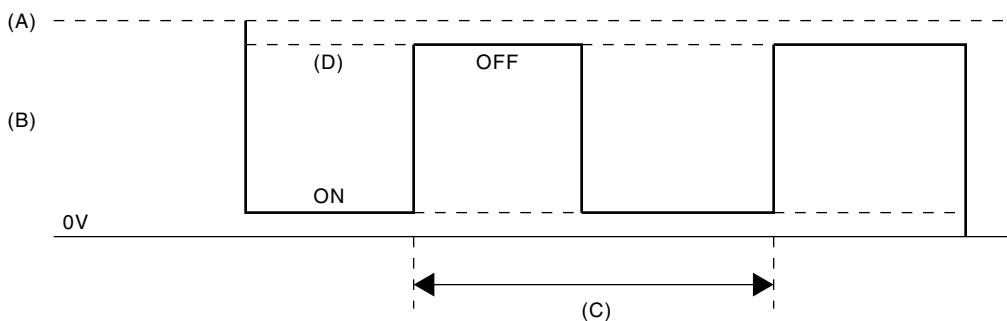
Memorize the freeze frame data. (For test mode \$02)

**E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

**2. COMPONENT DESCRIPTION**

EN-01793

- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) High abnormality

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

**4. GENERAL DRIVING CYCLE**

Always perform diagnosis continuously.

**5. DIAGNOSTIC METHOD**

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5\%$

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

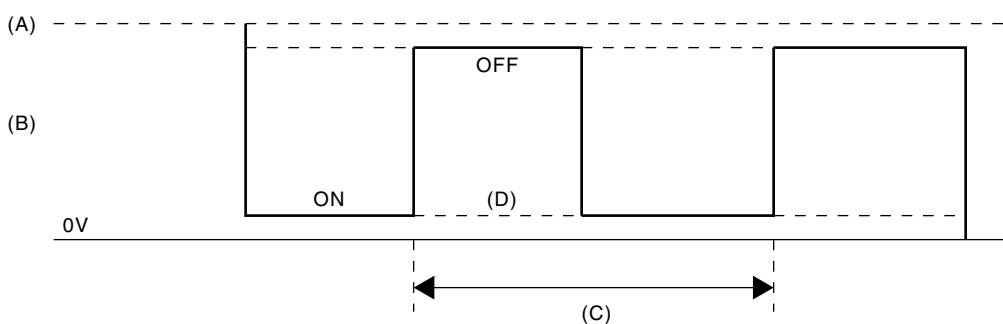
Memorize the freeze frame data. (For test mode \$02)

**F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)****1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

**2. COMPONENT DESCRIPTION**

EN-01792

- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) Low malfunction

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis continuously in 1 second after engine starting.

**5. DIAGNOSTIC METHOD**

- **Abnormality Judgment**

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

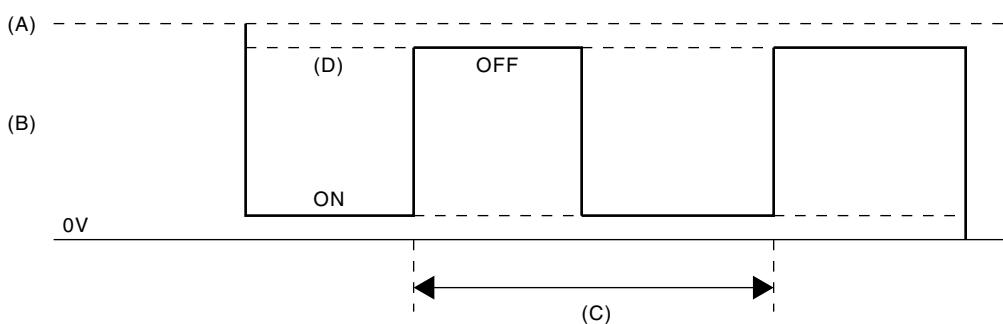
Memorize the freeze frame data. (For test mode \$02)

**G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)****1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

**2. COMPONENT DESCRIPTION**

EN-01793

- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycle)
- (D) High malfunction

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	$> 10.9$ V
Elapsed time after engine starting	$\geq 21$ second

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis continuously in 1 second after engine starting.

**5. DIAGNOSTIC METHOD**

- **Abnormality Judgment**

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	$\geq 25\%$

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

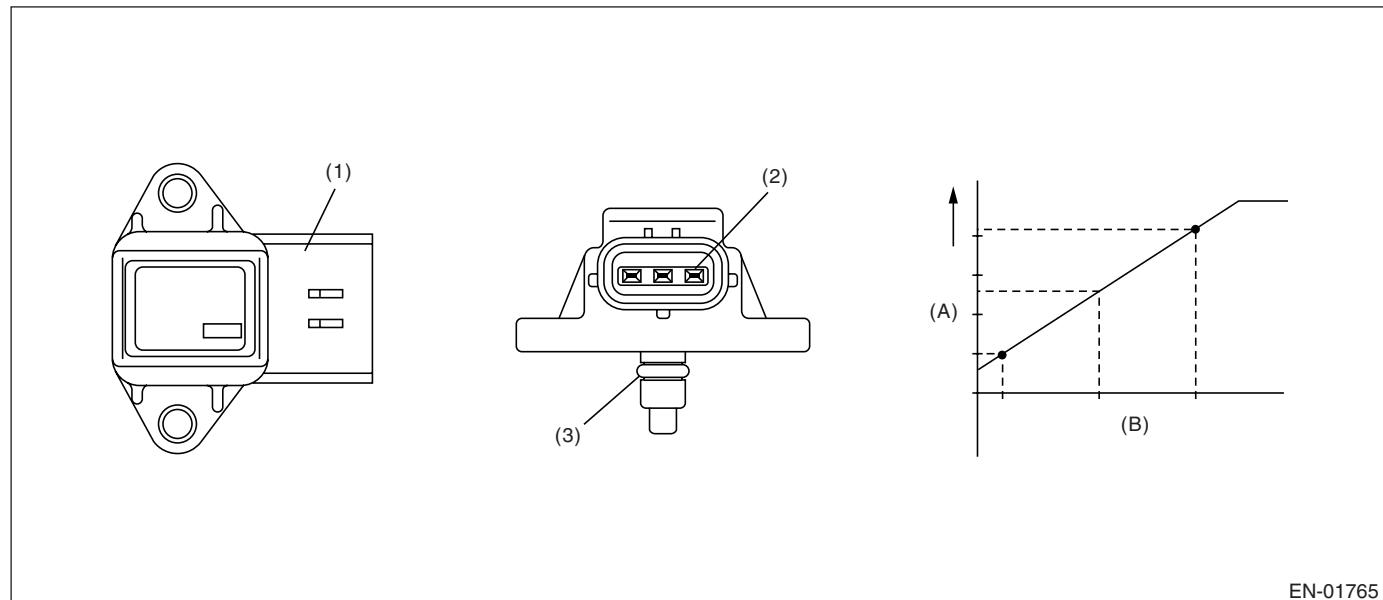
Memorize the freeze frame data. (For test mode \$02)

## H: DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

### 2. COMPONENT DESCRIPTION



EN-01765

(1)	Connector	(A)	Output voltage
(2)	Terminal	(B)	Absolute pressure
(3)	O-ring		

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	$< 2,500$ rpm
Throttle position	$\geq 10^{\circ}$
Output voltage	$< 1.0$ V
High side	
Engine speed	$600 \leftrightarrow 900$ rpm
Throttle position	$< 1.3^{\circ}$
Output voltage	$\geq 2.6$ V

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

### Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ↔ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATION AT DTC SETTING

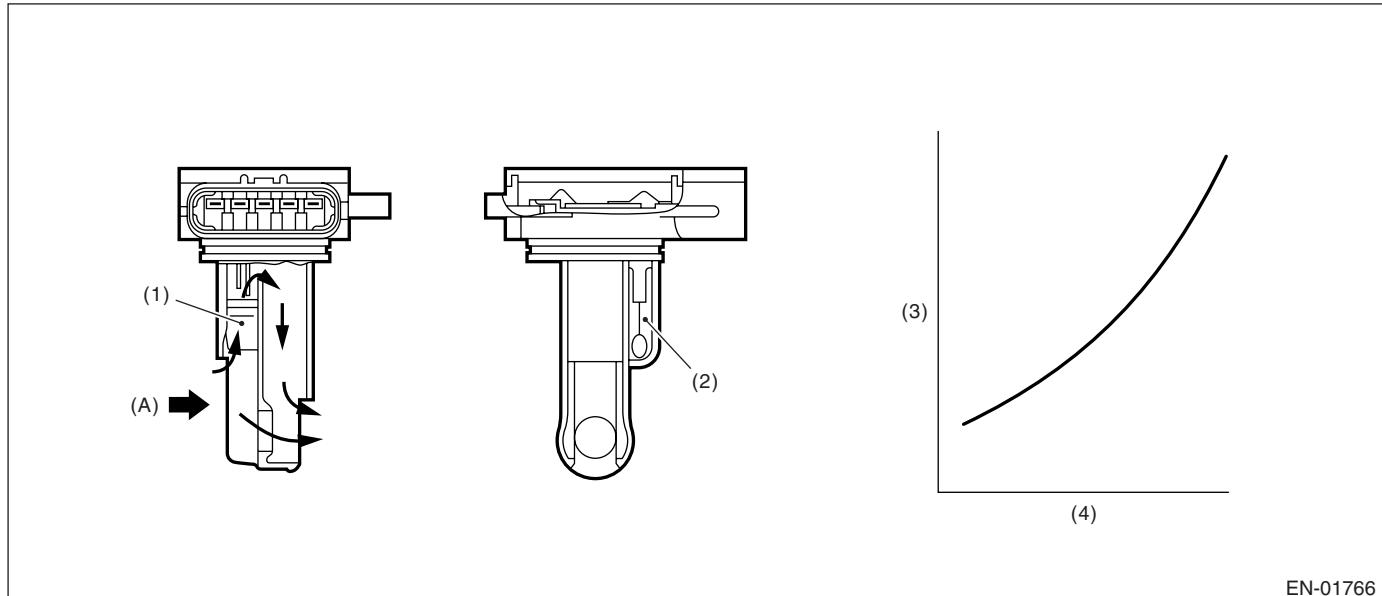
Memorize the freeze frame data. (For test mode \$02)

### I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

#### 2. COMPONENT DESCRIPTION



EN-01766

(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Voltage (V)		
(4)	Intake air volume (kg/s)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

#### Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG 1	
Output voltage	≥ 1.95 V
Engine speed	600 ↔ 1,200 rpm
Throttle angle	< 2.75°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
High side NG 2	
Output voltage	≥ 1.7 V
Engine speed	600 ↔ 1,200 rpm
Throttle angle	< 2.75°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Diagnosis for fuel system	Rich side malfunction

#### Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK the when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.5 V
Engine speed	550 ↔ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation =  $0^{\circ}\text{CA}$  is fixed.
  - At trouble: knock compensation  $\neq 0^{\circ}\text{CA}$  is fixed. (Retard max.  $12^{\circ}\text{CA}$  at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

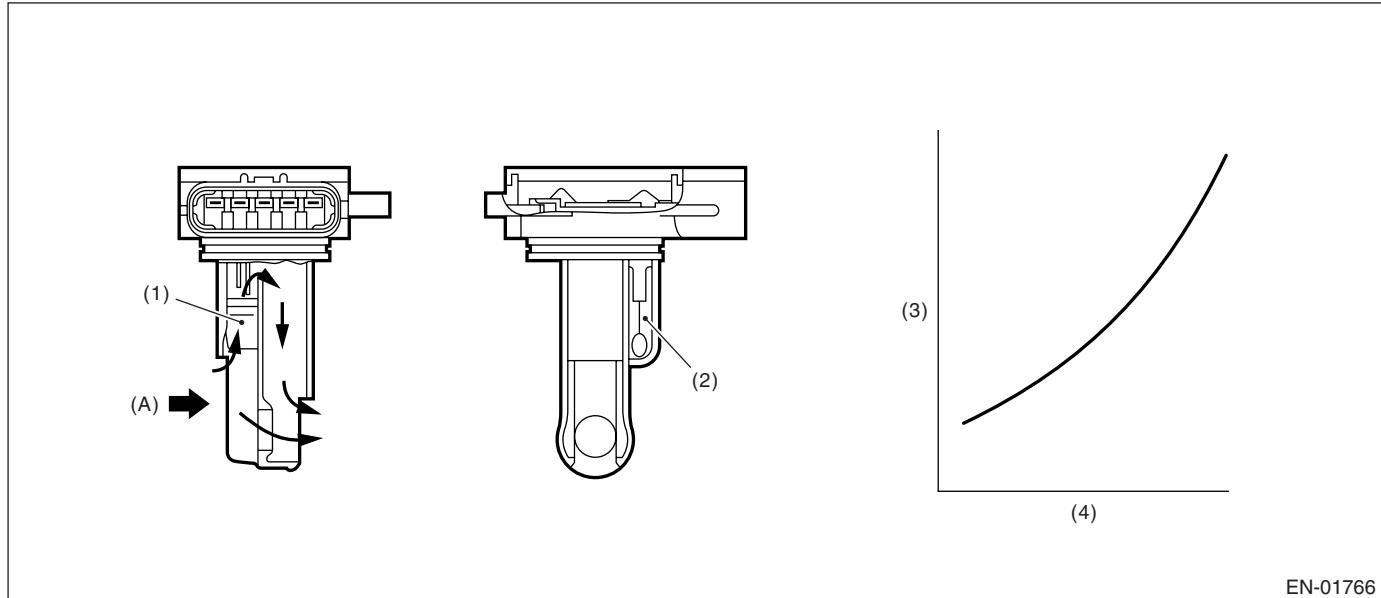
## GENERAL DESCRIPTION

### J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Voltage (V)		
(4)	Intake air volume (kg/s)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\leq 0.2$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation  $\neq$  0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

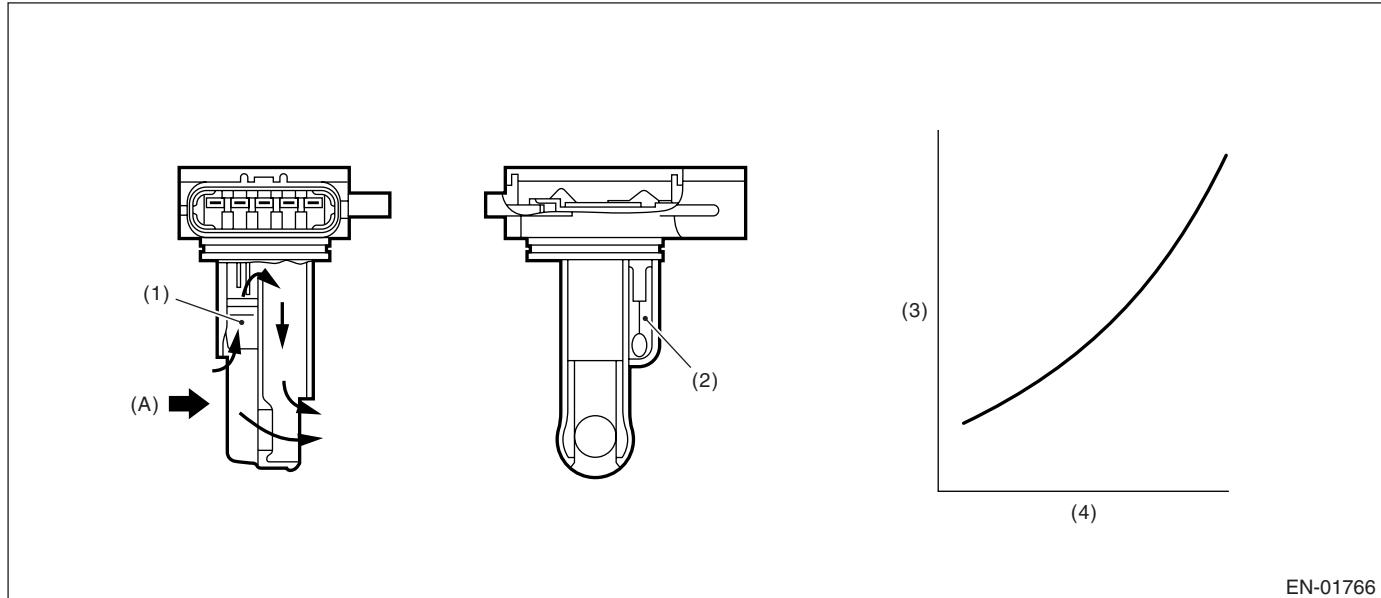
## GENERAL DESCRIPTION

### K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01766

(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Voltage (V)		
(4)	Intake air volume (kg/s)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.985$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation  $\neq$  0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

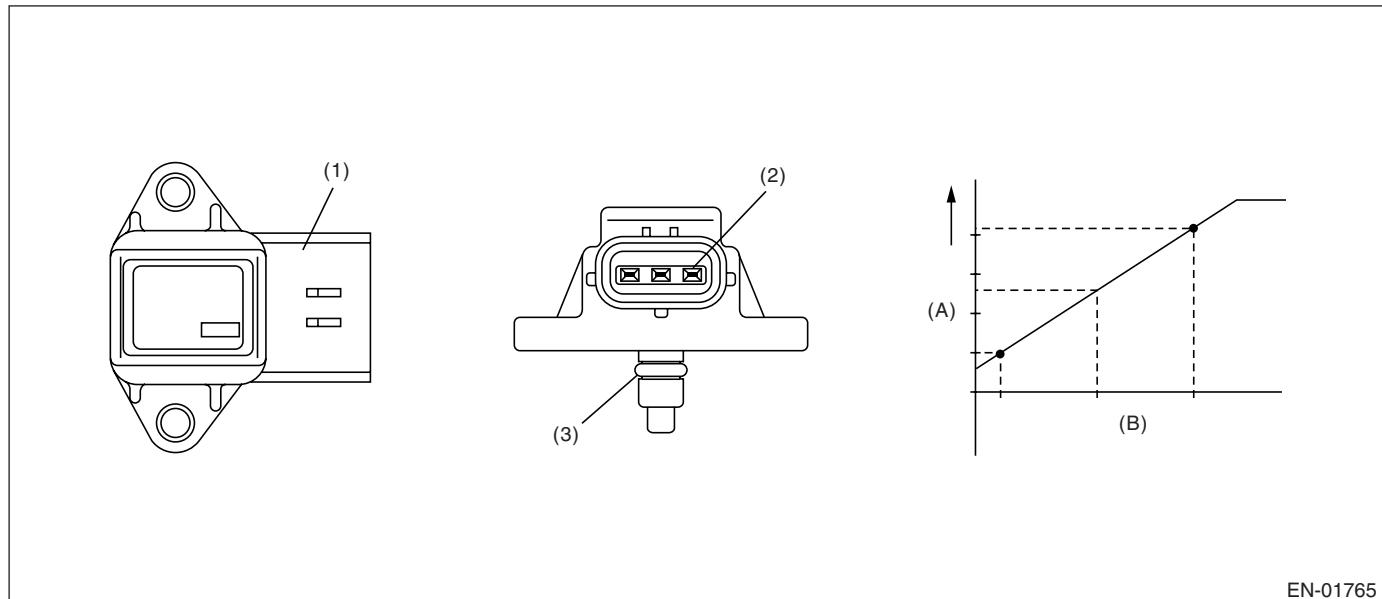
## GENERAL DESCRIPTION

### L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

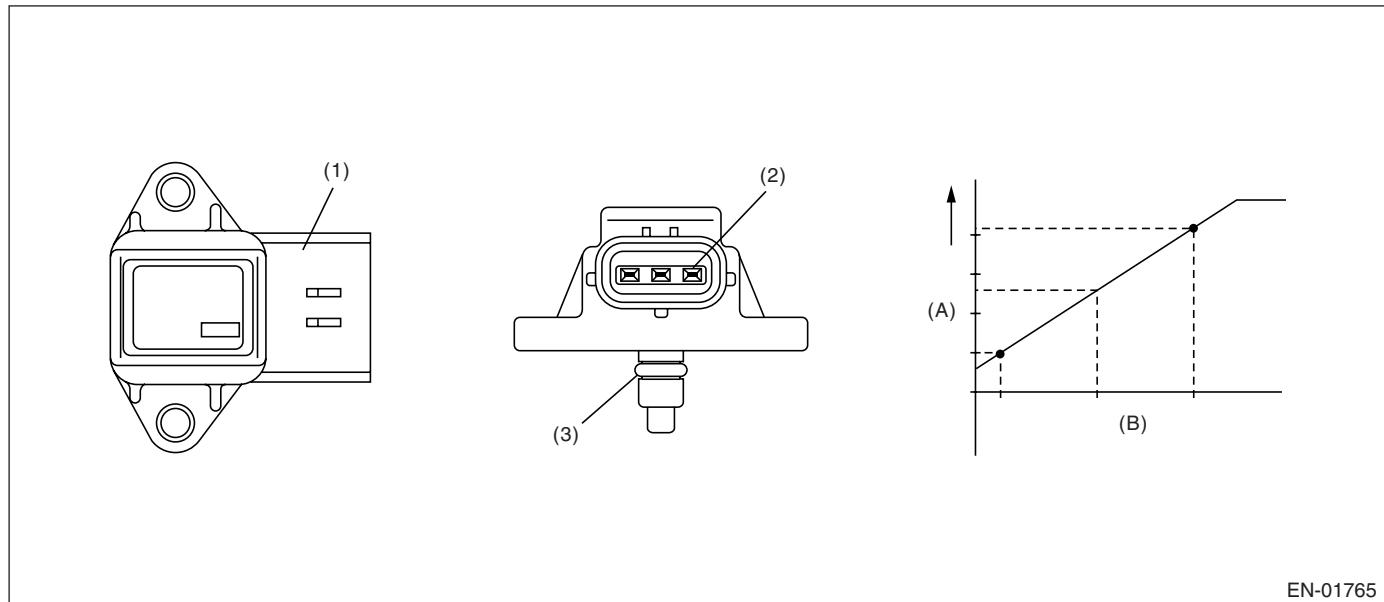
## GENERAL DESCRIPTION

### M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.921$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

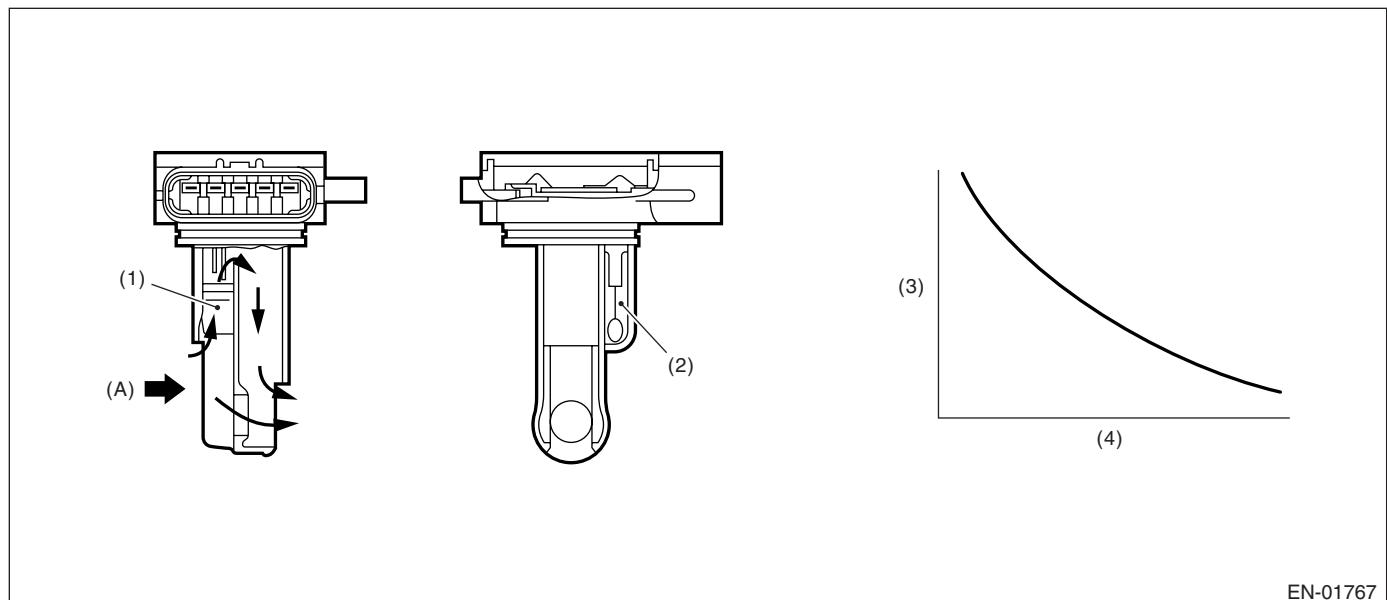
## GENERAL DESCRIPTION

### N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

#### 2. COMPONENT DESCRIPTION



EN-01767

(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Resistance value (Ω)		
(4)	Intake air temperature °C (°F)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

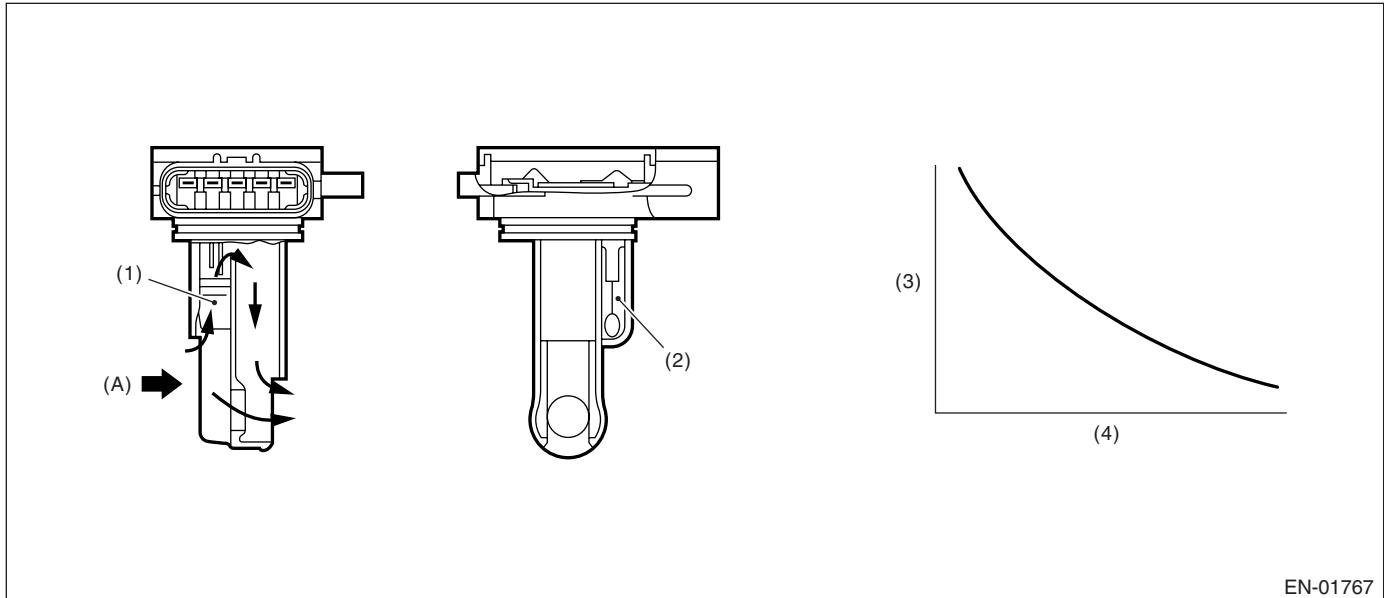
## GENERAL DESCRIPTION

### O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Resistance value ( $\Omega$ )		
(4)	Intake air temperature °C (°F)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.165$ V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

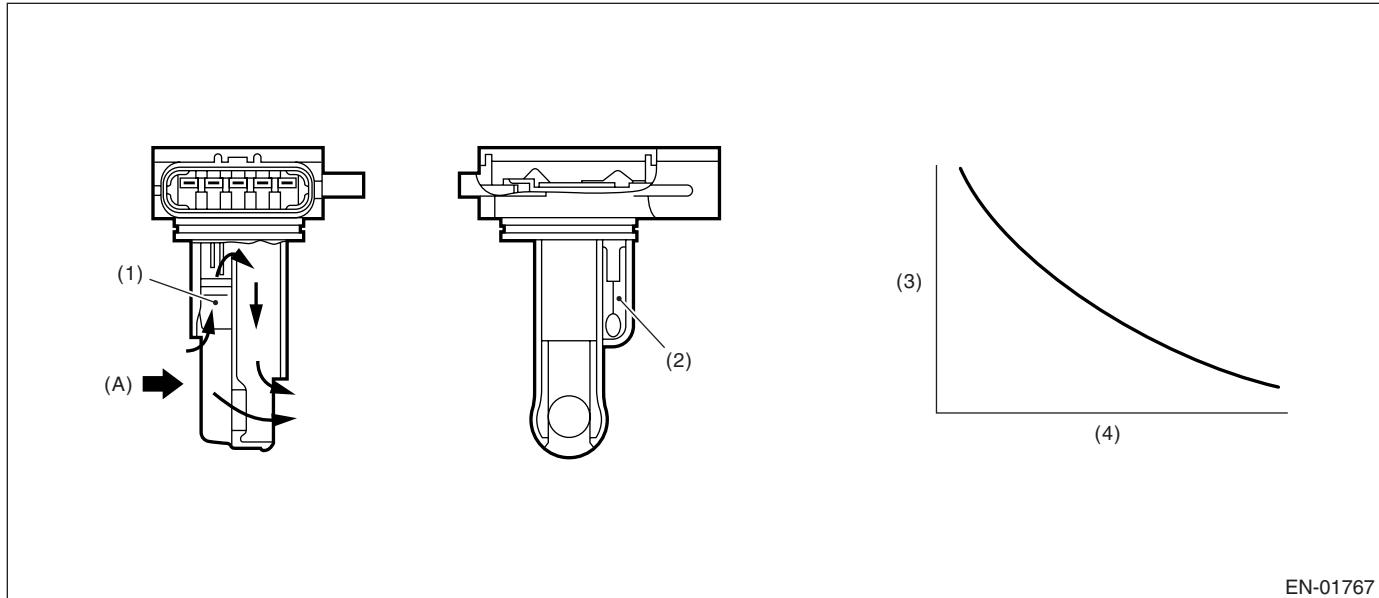
## GENERAL DESCRIPTION

### P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(1)	Air flow sensor	(A)	Air
(2)	Intake air temperature sensor		
(3)	Resistance value ( $\Omega$ )		
(4)	Intake air temperature °C (°F)		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72$ V
Ignition switch	ON

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.23$ V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

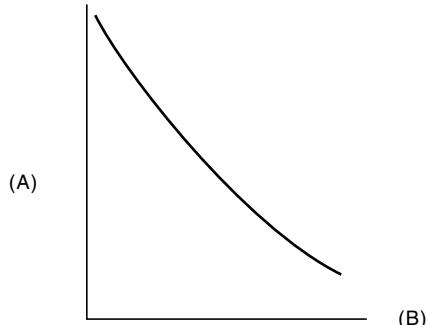
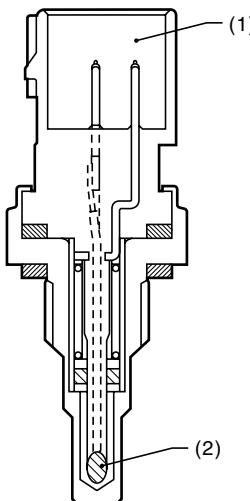
## GENERAL DESCRIPTION

### Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01690

(1) Connector  
(2) Thermistor element

(A) Resistance value (kΩ)  
(B) Temperature °C (°F)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

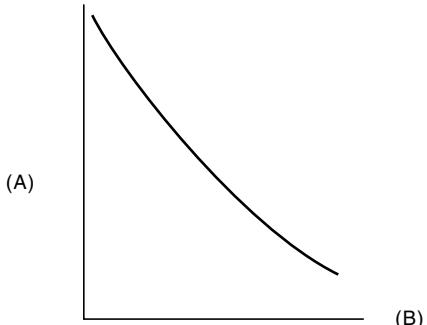
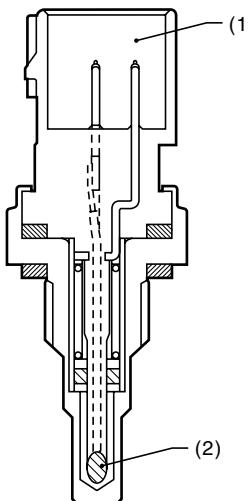
## GENERAL DESCRIPTION

### R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01690

(1) Connector  
(2) Thermistor element

(A) Resistance value (kΩ)  
(B) Temperature °C (°F)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.716$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

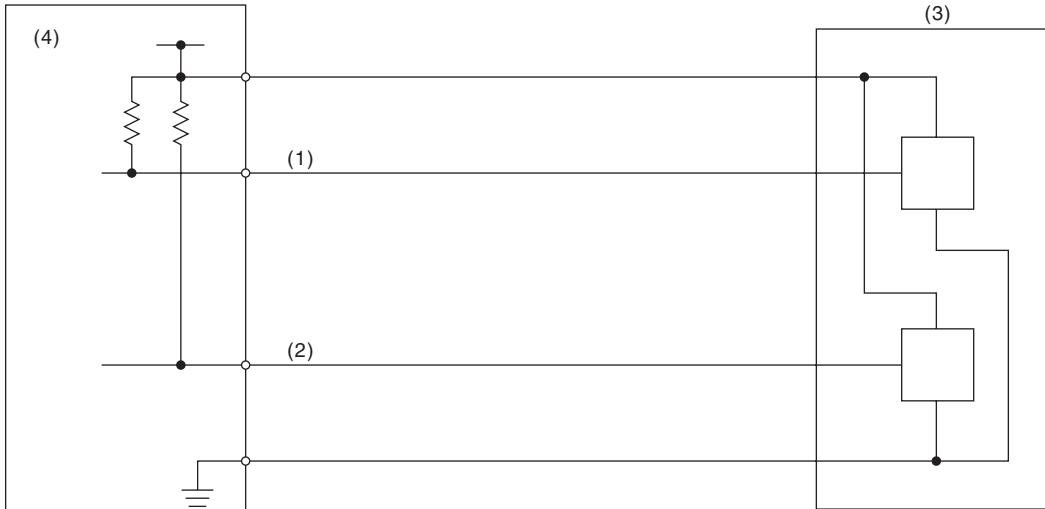
### S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\leq 0.309$ V

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

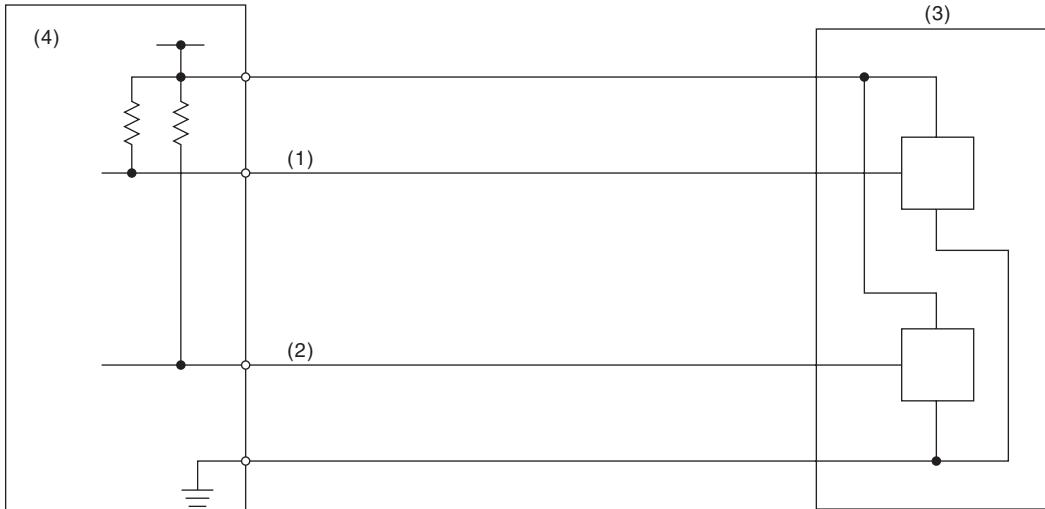
### T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\geq 4.646$ V

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

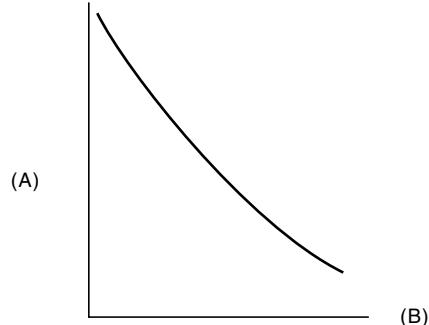
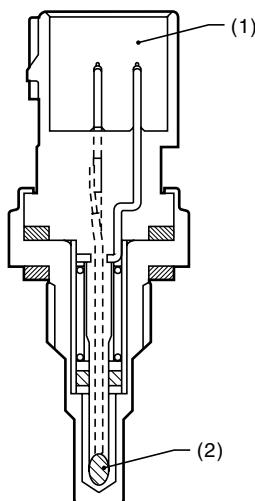
## GENERAL DESCRIPTION

### U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

#### 2. COMPONENT DESCRIPTION



EN-01690

(1) Connector  
(2) Thermistor element

(A) Resistance value (kΩ)  
(B) Temperature °C (°F)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Diagnosis of engine coolant temperature sensor property	Not finished
Engine speed	$\geq 500$ rpm
Battery voltage	$> 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$< 20^{\circ}\text{C}$ (68°F)
Timer for diagnosis after engine starting	$\geq$ Timer judgment value after engine starting

Timer for diagnosis after engine starting

- Timer stop at fuel cut mode.
- During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

$T_i$  is the lowest engine coolant temperature after starting the engine.

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$\geq 20^{\circ}\text{C}$ (68°F)

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at  $70^{\circ}\text{C}$  (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to  $70^{\circ}\text{C}$  (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

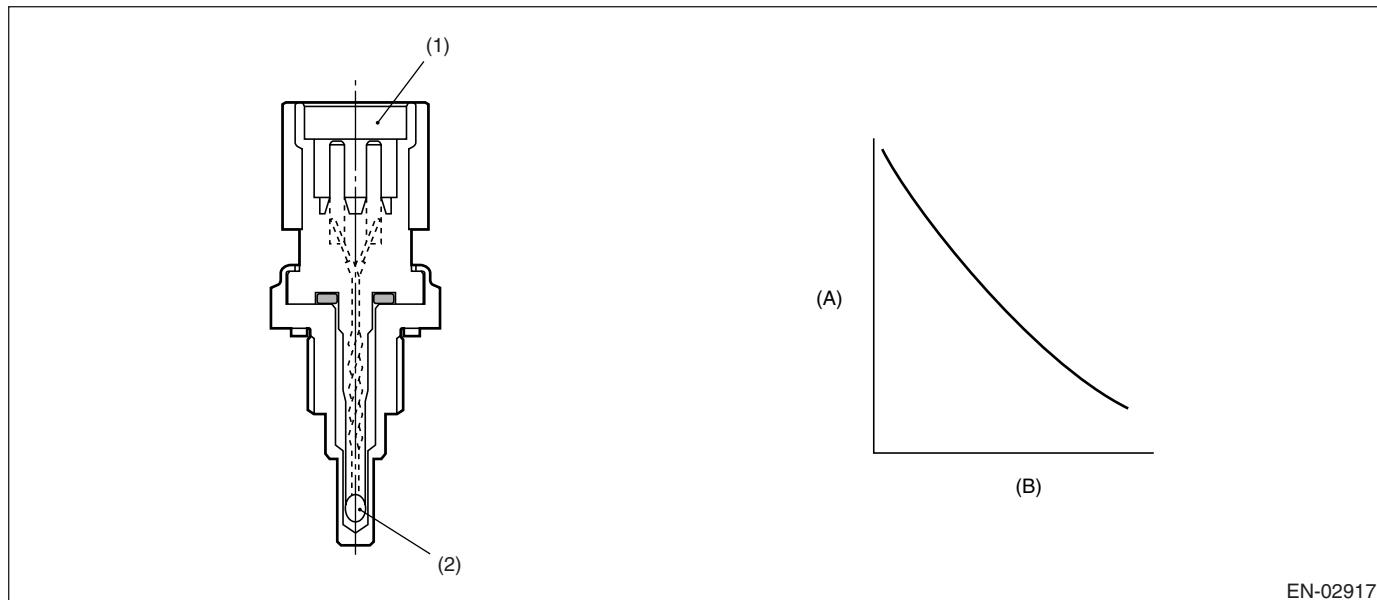
### V: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the engine coolant temperature sensor output does not change.

Judge NG when the engine coolant temperature sensor output does not change though the vehicle is operated in a manner which is expected to affect the engine coolant temperature.

#### 2. COMPONENT DESCRIPTION



EN-02917

(1) Connector	(A) Resistance value (kΩ)
(2) Thermistor element	(B) Temperature °C (°F)

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Kept for 20 seconds with vehicle speed $\geq 30$ km/h (18.6 MPH)	Experienced
Kept for 20 seconds with all the following conditions satisfied	Experienced
After starting engine	
Idling	
Vehicle speed = 0 km/h (0 MPH)	

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after idling and driving for predetermined time. (Judge OK/NG.)

#### 5. DIAGNOSTIC METHOD

Judge NG when the following criteria are satisfied, and OK when not satisfied.

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor Max. voltage – Min. voltage	< 5 mV

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illuminations:** Detect when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

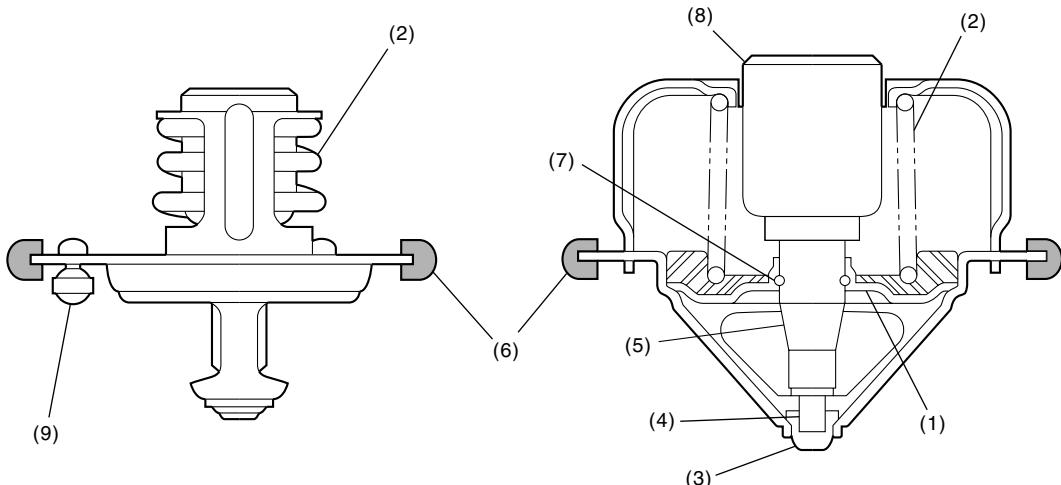
## GENERAL DESCRIPTION

### W: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

#### 2. COMPONENT DESCRIPTION



EN-01692

(1)	Valve	(6)	Rubber packing
(2)	Spring	(7)	Stop ring
(3)	Stopper	(8)	Wax element
(4)	Piston	(9)	Jiggle valve
(5)	Guide		

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^\circ\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	$< 55^\circ\text{C}$ (131°F)
Estimated engine coolant temperature	$\geq 75^\circ\text{C}$ (167°F)
Engine coolant temperature	$< 75^\circ\text{C}$ (167°F)
(Estimated – measured) engine coolant temperature	$> 20^\circ\text{C}$ (68°F)

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^\circ\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	$< 55^\circ\text{C}$ (131°F)
Engine coolant temperature	$\geq 75^\circ\text{C}$ (167°F)
(Estimated – measured) engine coolant temperature	$\leq 30^\circ\text{C}$ (86°F)

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

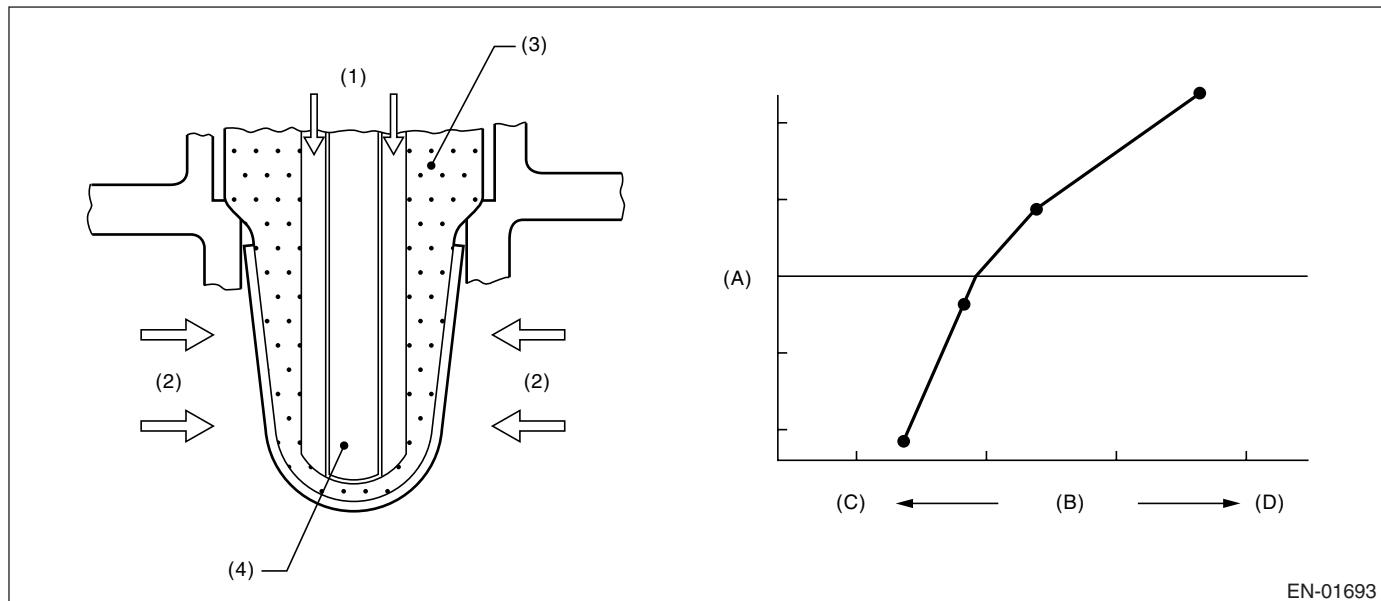
### X: DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	$< 1.8$ V
Input current	$< -0.01$ A

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

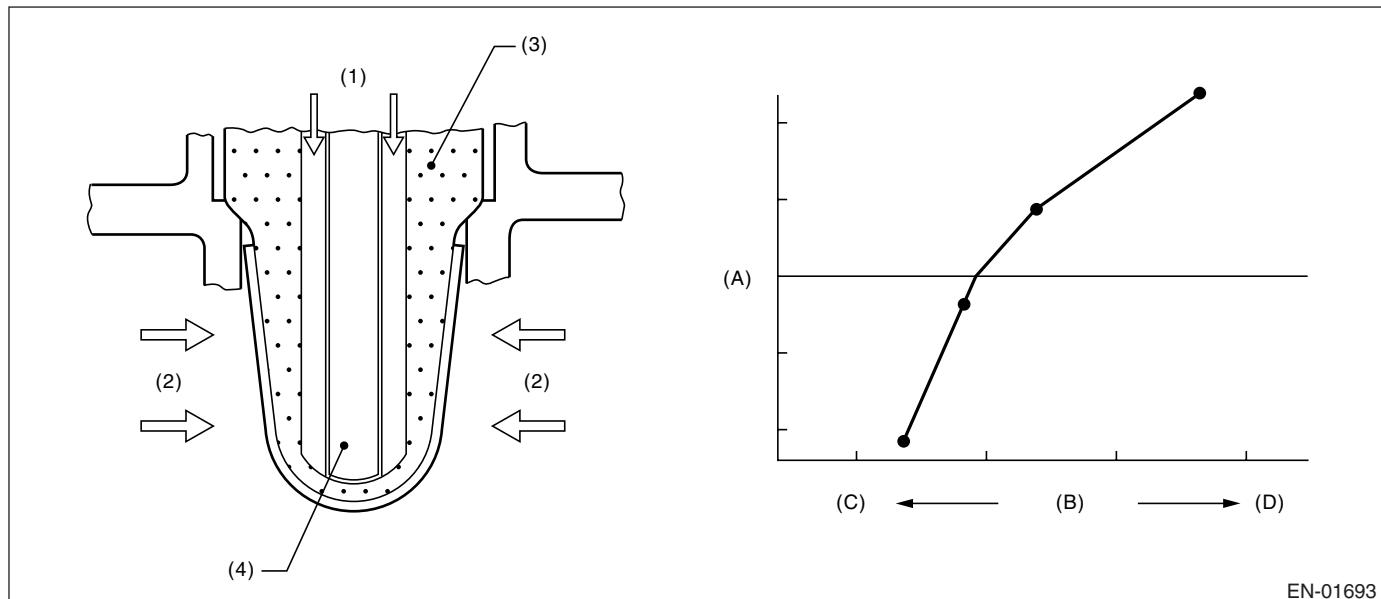
### Y: DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 10.9$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	$\geq 3.8$ V
Input current	$\geq 0.01$ A

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

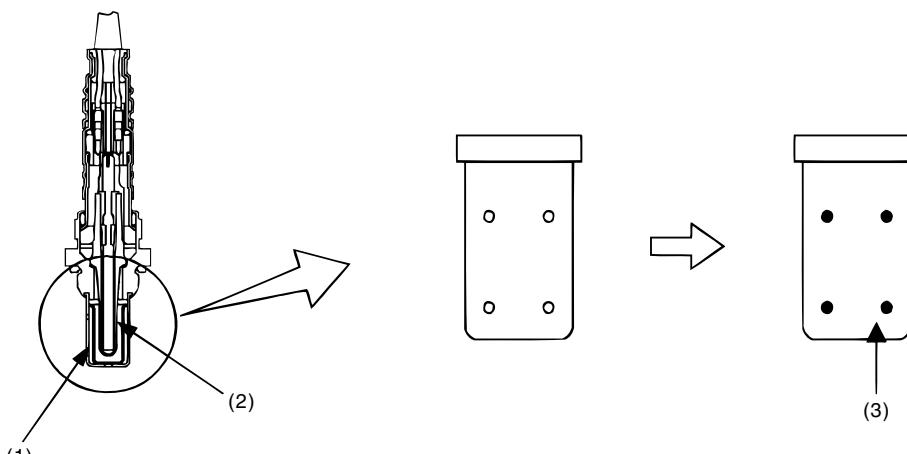
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Z: DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

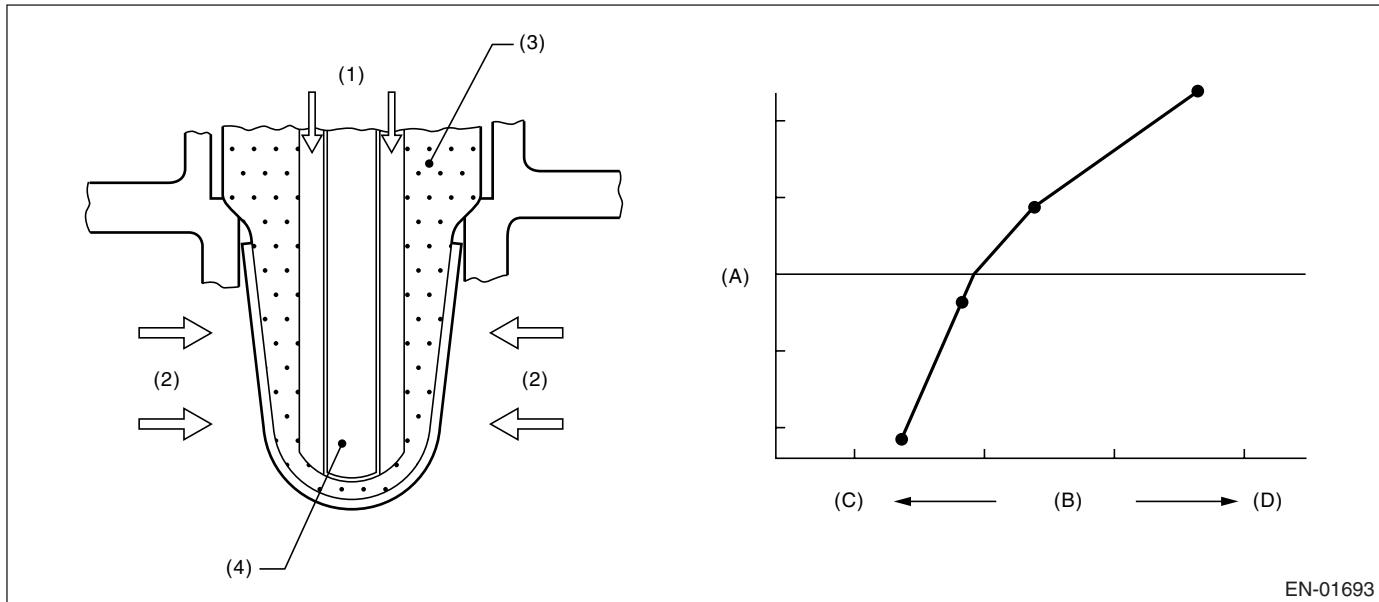
Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



EN-01694

- (1) Cover
- (2) Zirconia
- (3) Clogging

### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Diagnosis of A/F response	Not done
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 $\leftrightarrow$ 50 $\Omega$
After engine starting	120 seconds or more
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Engine speed	1,000 $\leftrightarrow$ 3,200 rpm
Vehicle speed	10 $\leftrightarrow$ 120 km/h (6.21 $\leftrightarrow$ 74.6 MPH)
Amount of intake air	10 $\leftrightarrow$ 31 g/s
Engine load change during 0.5 engine rev.	$\leq 0.01$ g/rev
All conditions for EVAP canister purge	to be in enable
Learning value of EVAP conc. during purge	$\leq 0.2$
Accumulated time of operating canister purge	20 seconds or more

### 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

Integrate the difference of  $faf$  in every 128 milliseconds and difference of  $\lambda$  value.

After integrate 1,640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
$parafca = \frac{td2faf}{td2lmd}$ where, $td2faf (N) = td2faf (n-1) +  d2faf (n) $ $td2lmd (N) = td2lmd (n-1) +  d2lmd (n) $ add up for a total of 210 seconds $d2faf (n) = (faf (n) - faf (n-1)) - (faf (n-1) - faf (n-2))$ $d2lmd (n) = (lmd (n) - lmd (n-1)) - (lmd (n-1) - lmd (n-2))$ $faf$ = main feedback compensation coefficient every 128 milliseconds $lmd$ = output lambda every 128 milliseconds	$\geq 0.30$

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

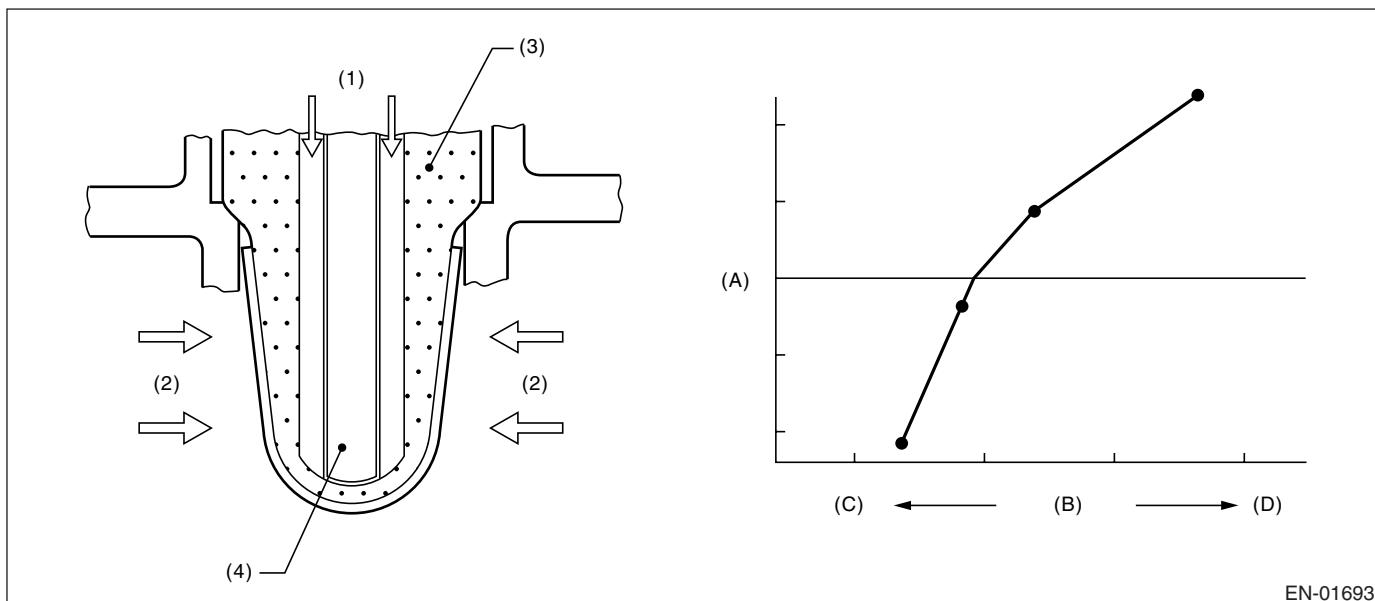
## AA:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Variable amount of Front O <sub>2</sub> (A/F) sensor heater control duty every 128 milliseconds	≥ 28,000%
Front lambda sensor impedance	≥ 500 Ω

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

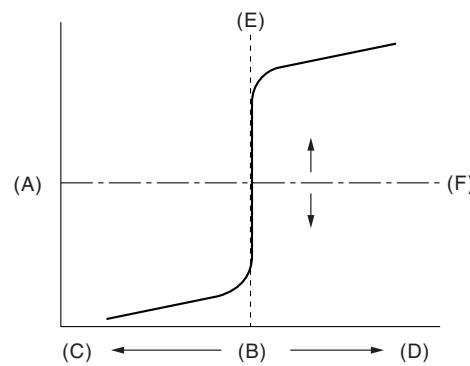
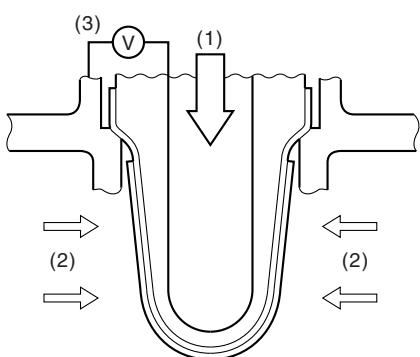
- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AB:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

**2. COMPONENT DESCRIPTION**

EN-01696

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	Electromotive force	(C)	Rich
		(D)	Lean
		(E)	Theoretical air fuel ratio
		(F)	Comparative voltage

**3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)**

Secondary Parameters	Enable Conditions
Low side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	$\geq 0.54$ V
Amount of intake air with main feedback control	$\geq 10$ g/s
Engine coolant temperature with main feedback control	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	$> 10.9$ V
Cumulative time for completing the conditions with main feedback control	$\geq 200$ seconds
5 seconds or more fuel shut-off in decel.	Experienced

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 490 mV

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 490 mV

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

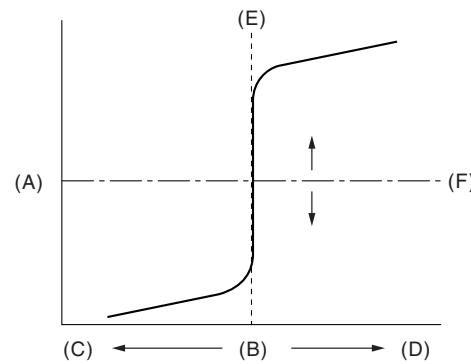
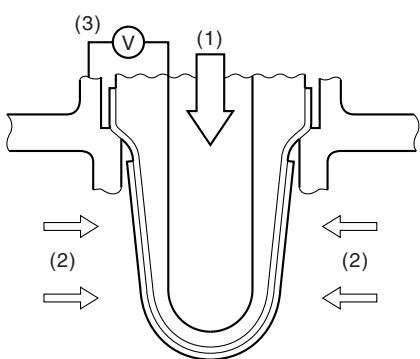
Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AC:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

**2. COMPONENT DESCRIPTION**

EN-01696

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	Electromotive force	(C)	Rich
		(D)	Lean
		(E)	Theoretical air fuel ratio
		(F)	Comparative voltage

**3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)**

Secondary Parameters	Enable Conditions
High side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	$\geq 0.54$ V
Amount of intake air with main feedback control	$\geq 10$ g/s
Engine coolant temperature with main feedback control	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	$> 10.9$ V
Cumulative time for completing the conditions with main feedback control	$\geq 200$ seconds
5 seconds or more fuel shut-off in decel.	Experienced

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	$\leq 250$ mV

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### AD:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O<sub>2</sub> sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O<sub>2</sub> sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

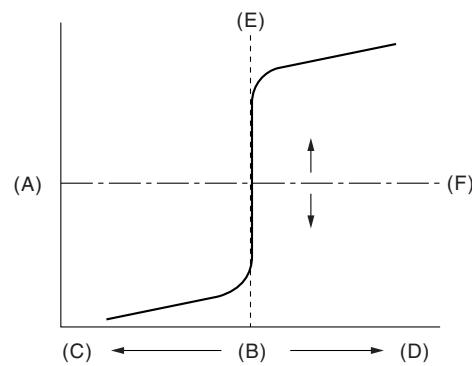
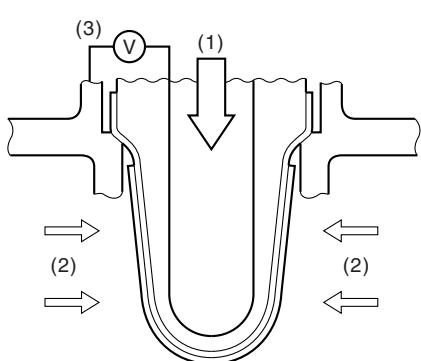
(1) The response time of output change of O<sub>2</sub> sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

#### • Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

#### 2. COMPONENT DESCRIPTION



EN-01696

(1) Atmosphere	(A) Electromotive force	(D) Lean
(2) Exhaust	(B) Air fuel ratio	(E) Theoretical air fuel ratio
(3) Electromotive force	(C) Rich	(F) Comparative voltage

#### 3. ENABLE CONDITION

- Rich → Lean response diagnosis

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

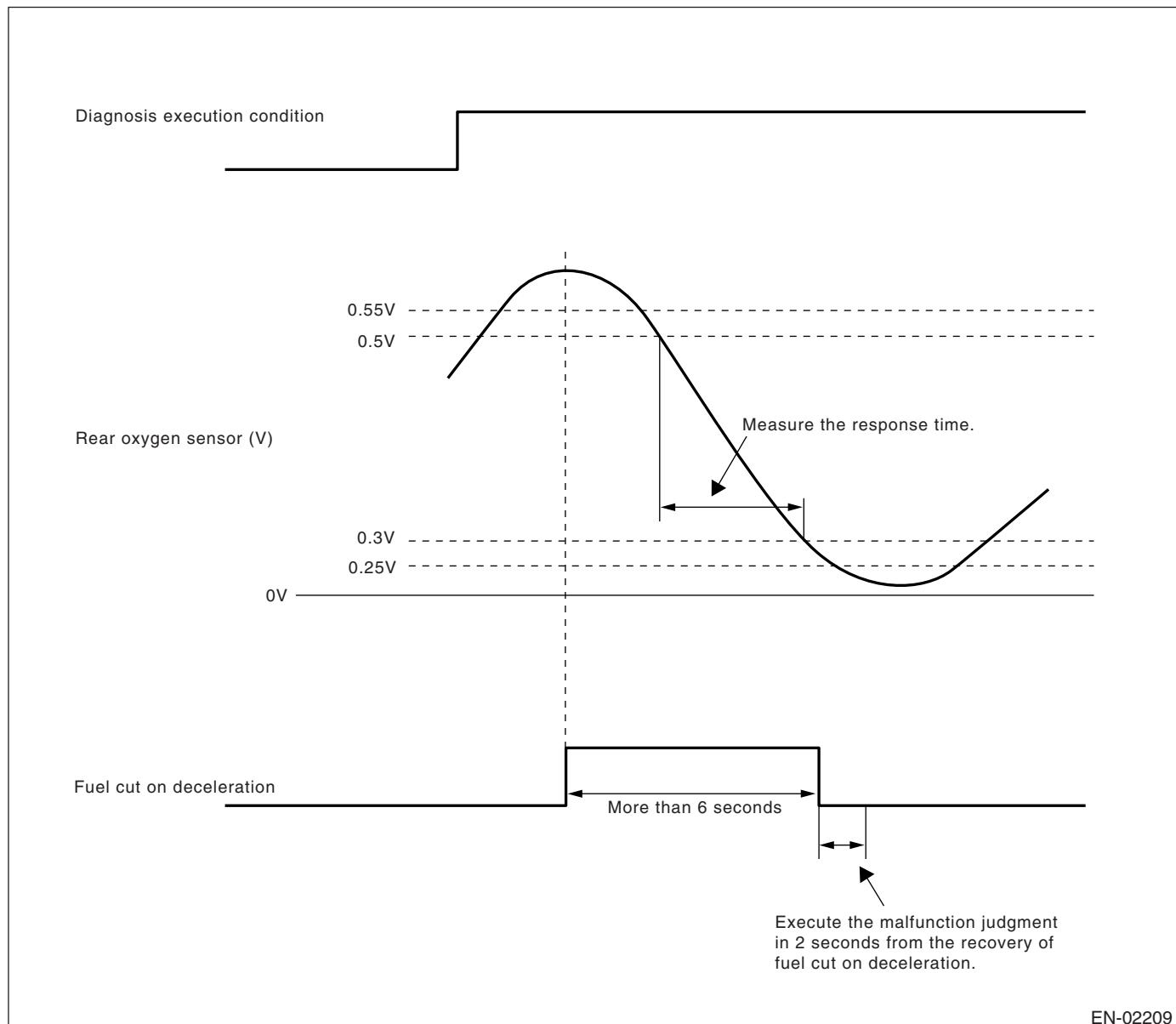
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
6 seconds or more fuel shut-off indecel.	Experienced
After fuel cut	$\geq 2$ seconds
Accumulated time with rear oxygen sensor heater ON	$\geq 60$ seconds
Continuous time with rear oxygen sensor heater ON	$\geq 30$ seconds
Catalyst couture warm up	$\geq 11,000$ seconds

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

## 5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6s or more), and although carried out the fuel shut-off in deceleration cut return, when O<sub>2</sub> sensor voltage is large (more than 0.55 V).

### Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.698 milliseconds
Time when more than 550 mV	> 2 seconds

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

(2) A normal judging is not carried out.

### Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (500 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (300 mV).	≤ 0.698 seconds

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## 10.ENABLE CONDITION

- Lean → Rich response diagnosis

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

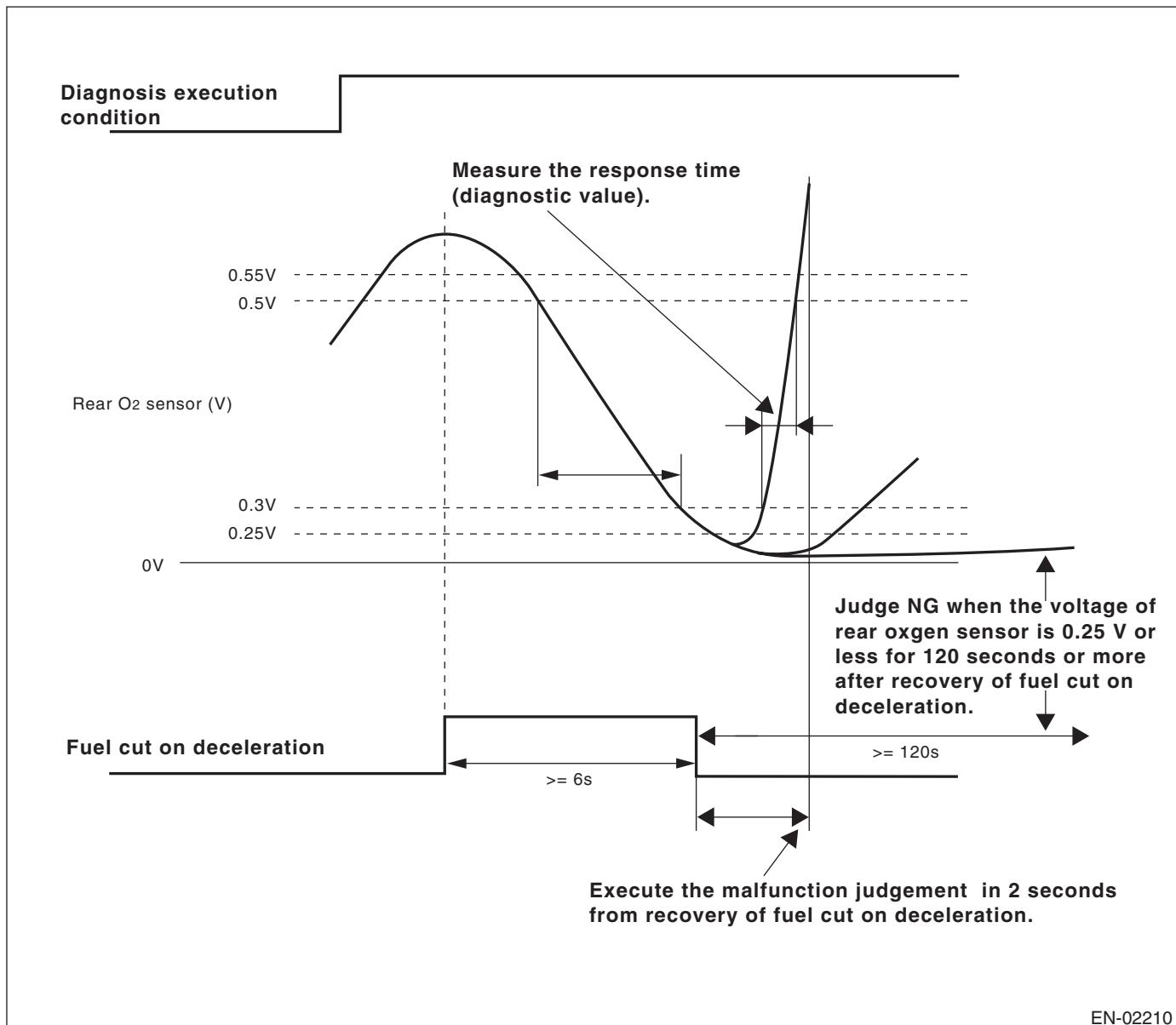
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Fuel cut on deceleration $\geq$ 6 seconds	Experienced
After fuel cut	$\geq$ 2 seconds

## 11. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

## 12. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



EN-02210

### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value  $\rightarrow$  Abnormal

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small.

### Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Or longest time to change to 250 mV	> 120 seconds

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

Response Time (diagnosis value)  $\leq$  Threshold value  $\rightarrow$  Normal

(2) A normal judging is not carried out.

### Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (300 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (500 mV).	$\leq$ 2 seconds

## 13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 15.FAIL SAFE

Sub feedback control: Not allowed

## 16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

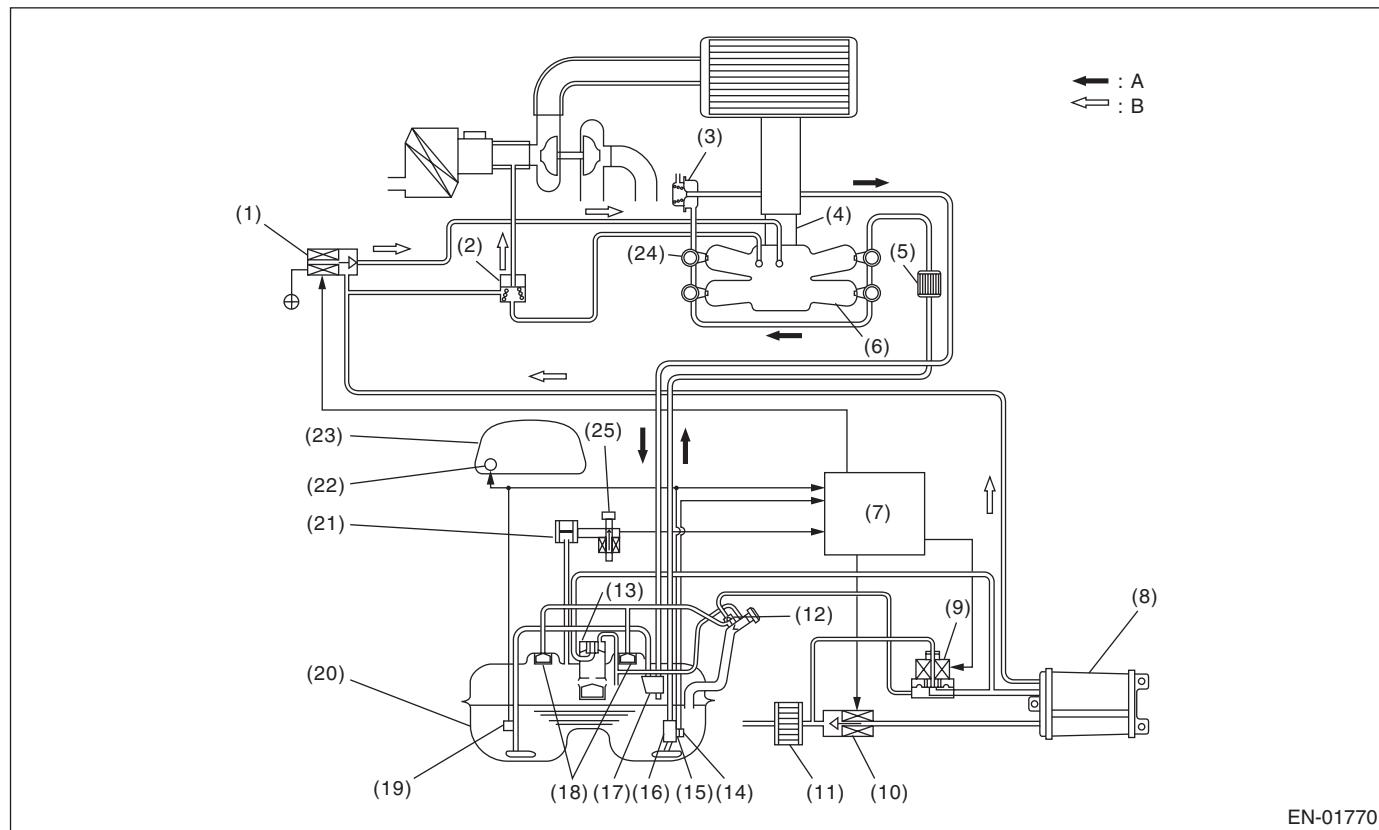
## GENERAL DESCRIPTION

### AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

##### • Fuel System Diagnosis



EN-01770

(1)	Purge control solenoid valve	(14)	Fuel temperature sensor
(2)	Purge valve	(15)	Fuel level sensor
(3)	Pressure regulator	(16)	Fuel pump
(4)	Throttle body	(17)	Jet pump
(5)	Fuel filter	(18)	Fuel cut valve
(6)	Intake manifold	(19)	Fuel sub level sensor
(7)	Engine control module (ECM)	(20)	Fuel tank
(8)	Canister	(21)	Fuel tank pressure sensor
(9)	Pressure control solenoid valve	(22)	Fuel meter
(10)	Drain valve	(23)	Combination meter
(11)	Drain filter	(24)	Fuel injector
(12)	Shut-off valve	(25)	Tank pressure switching solenoid valve
(13)	Vent valve		

##### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 $\leftrightarrow$ 119°C (167 $\leftrightarrow$ 246°F)
Engine load	$\geq$ Map 5
Intake air change during 0.5 engine rev.	$\leq$ 0.02 g/rev
Learning value of EVAP conc. during purge	$\leq$ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

#### Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

#### Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + fas + fal$ where, sglmd = measured lambda tglmda = target lambda  fas = main feedback compensation coefficient every 64 milliseconds fal = main feedback learning compensation coefficient	$\geq fsobdL1$ See Map 4  $fsobdL1$ = lean side threshold value of fsobd

#### Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + fas + fal$	$< 19\%$

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

### 8. ECM OPERATION AT DTC SETTING

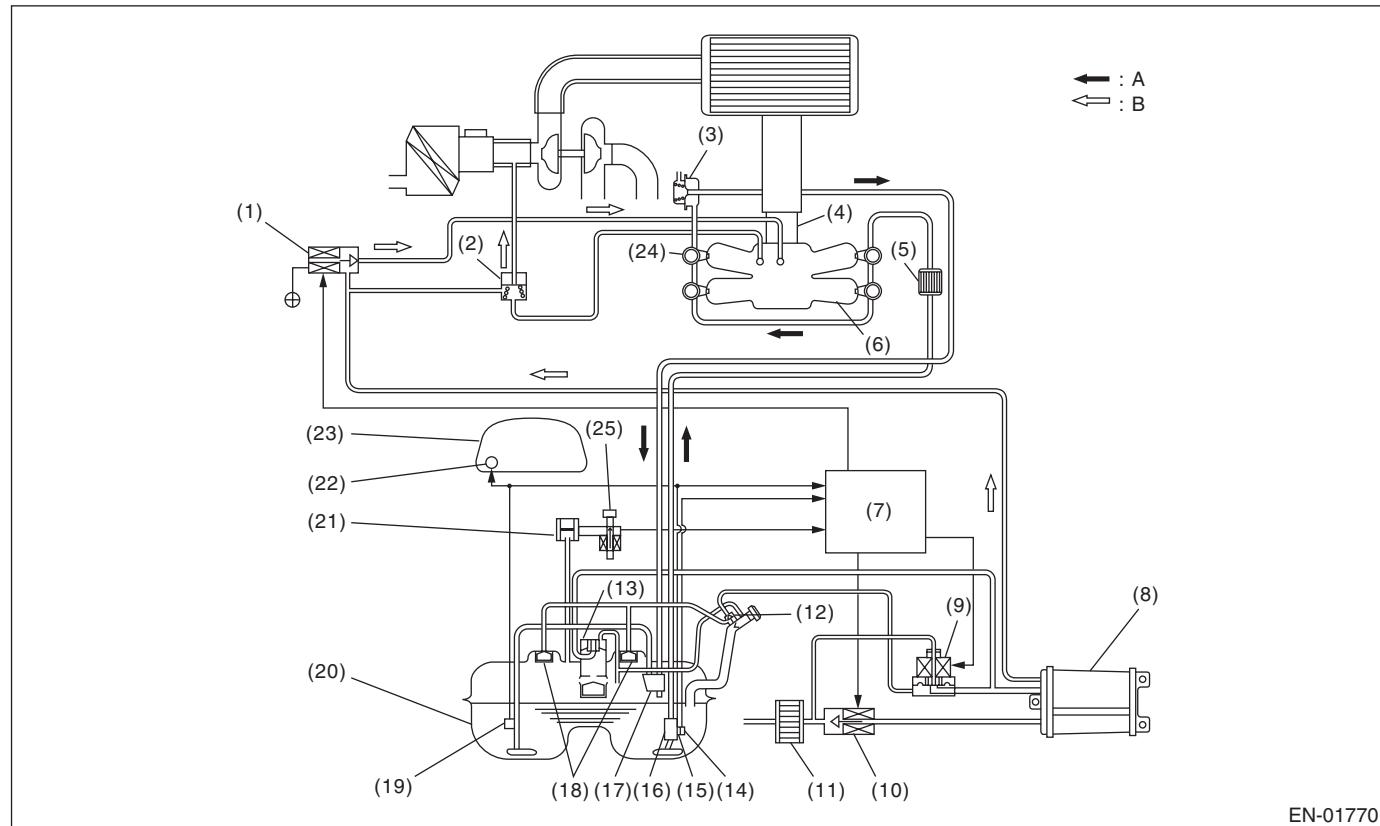
Memorize the freeze frame data. (For test mode \$02)

### AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

##### • Fuel System Diagnosis



(1)	Purge control solenoid valve	(14)	Fuel temperature sensor
(2)	Purge valve	(15)	Fuel level sensor
(3)	Pressure regulator	(16)	Fuel pump
(4)	Throttle body	(17)	Jet pump
(5)	Fuel filter	(18)	Fuel cut valve
(6)	Intake manifold	(19)	Fuel sub level sensor
(7)	Engine control module (ECM)	(20)	Fuel tank
(8)	Canister	(21)	Fuel tank pressure sensor
(9)	Pressure control solenoid valve	(22)	Fuel meter
(10)	Drain valve	(23)	Combination meter
(11)	Drain filter	(24)	Fuel injector
(12)	Shut-off valve	(25)	Tank pressure switching solenoid valve
(13)	Vent valve		

##### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 $\leftrightarrow$ 119°C (167 $\leftrightarrow$ 246°F)
Engine load	$\geq$ Map 5
Intake air change during 0.5 engine rev.	$\leq$ 0.02 g/rev
Learning value of EVAP conc. during purge	$\leq$ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

#### Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

#### Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) +faf + flaf$ where, $sglmd$ = measured lambda  $tglmda$ = target lambda $faf$ = main feedback compensation coefficient every 64 milliseconds $flaf$ = main feedback learning compensation coefficient	$\leq fsobdR1$ See Map 4 $fsobdR1$ = rich side threshold value of $fsobd$

#### Map 4 Threshold value for fuel system malfunction criteria for System E

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
$fsobdR1$ (%)	-40	-40	-36.9	-32.0	-27.0	-27.0

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) +faf + flaf$	$\geq -20\%$

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

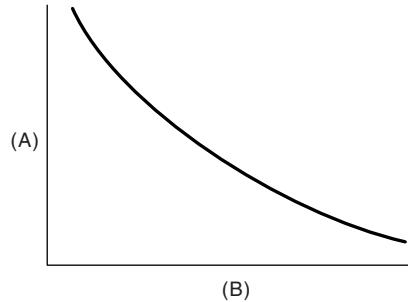
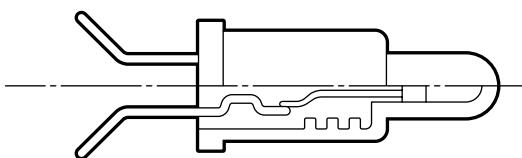
#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

##### • Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

#### 2. COMPONENT DESCRIPTION



EN-01700

- (A) Resistance value ( $\Omega$ )
- (B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 10 \text{ l}$ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^\circ\text{C}$ (50°F)
Fuel temperature – engine coolant temperature	$\geq 10^\circ\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 10 \text{ l}$ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^\circ\text{C}$ (50°F)
Fuel temperature – engine coolant temperature	$< 10^\circ\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

## 6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

## 7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

## 8. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	$\geq 550 \text{ kg}$ (1,212.5 lb)
Fuel temperature difference between Max. and Min.	$< 3^\circ\text{C}$ (37.4°F)

**Time Needed for Diagnosis:** To be determined.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	$\geq 550 \text{ kg (1,212.5 lb)}$
Fuel temperature difference between Max. and Min.	$\geq 3^\circ\text{C (37.4°F)}$

## 9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 10. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 11. FAIL SAFE

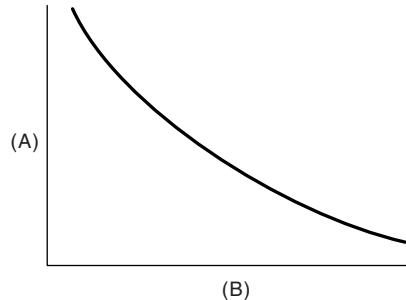
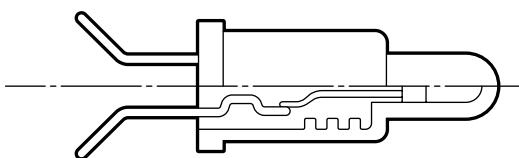
None

## 12. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

**2. COMPONENT DESCRIPTION**

EN-01700

(A) Resistance value ( $\Omega$ )  
 (B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage	$< 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

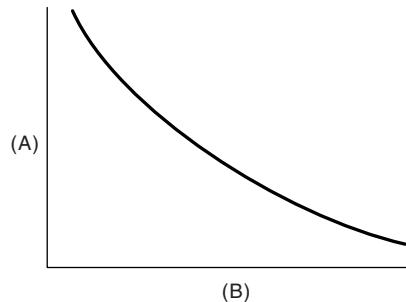
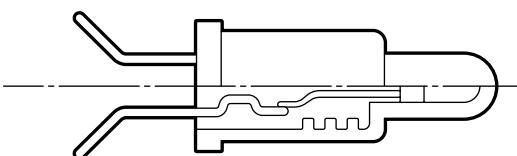
None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AI: DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

**2. COMPONENT DESCRIPTION**

EN-01700

(A) Resistance value ( $\Omega$ )  
 (B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Output voltage	$< 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

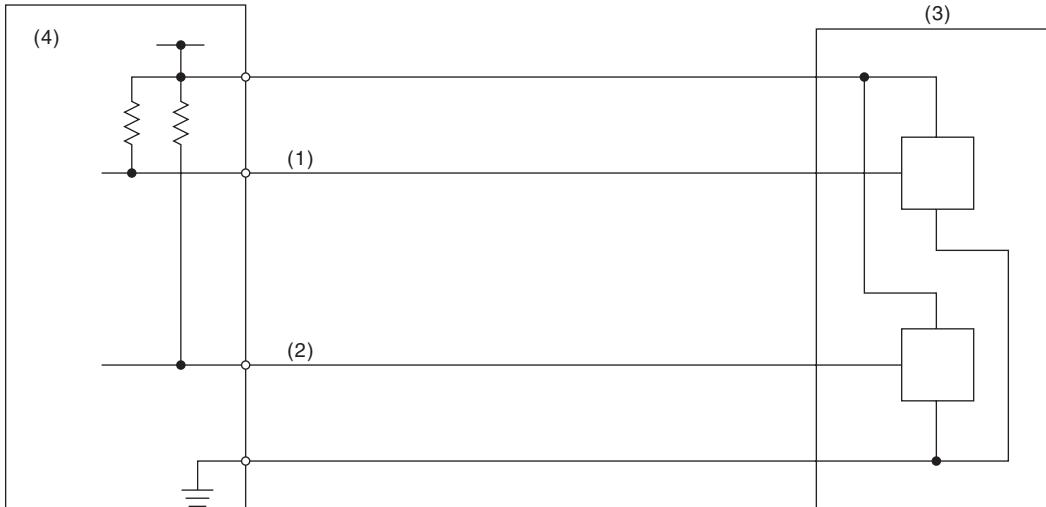
## AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\leq 0.749$ V

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

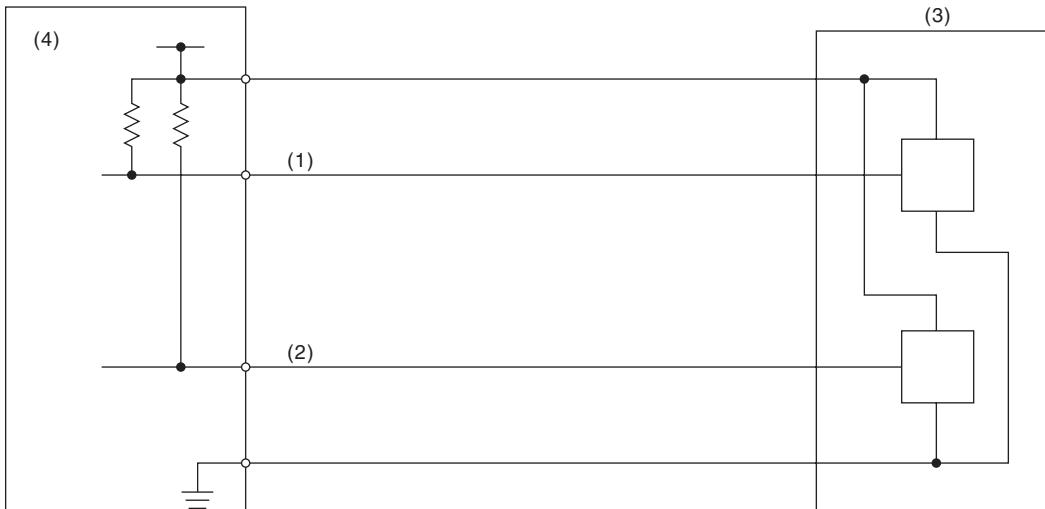
## AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\geq 4.747$ V

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

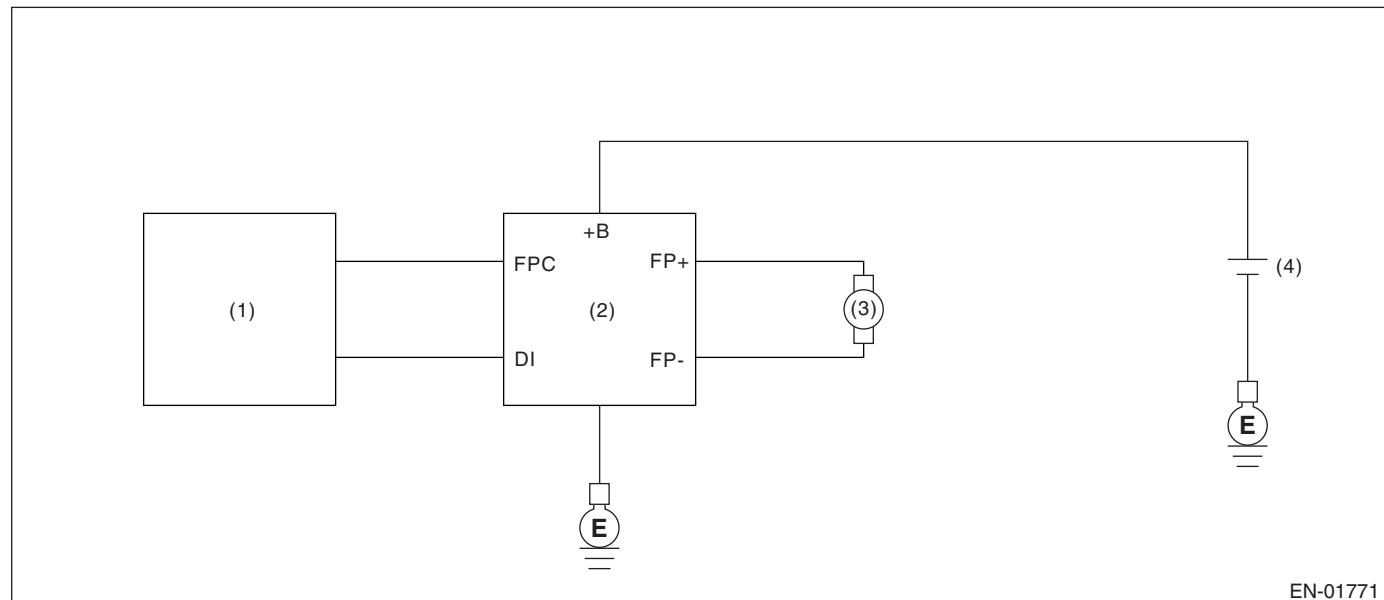
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel pump control unit
- (3) Fuel pump
- (4) Battery

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 8$ V
After engine starting	180 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	$\geq 10$ ℥ (2.6 US gal, 2.2 Imp gal)

**Time Needed for Diagnosis:** 2.5 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

## 9. ECM OPERATION AT DTC SETTING

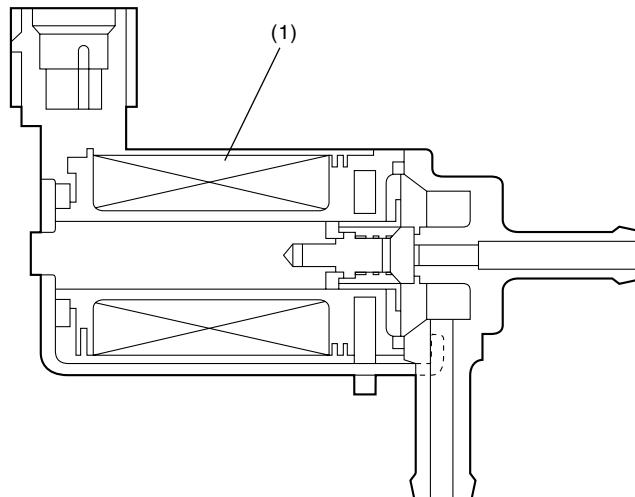
Memorize the freeze frame data. (For test mode \$02)

## AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	$\geq$ Map 10

#### Map 10

Pa (kPa (mmHg, inHg))	56.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold (kPa (mmHg, inHg))	170.0 (1,275, 50.2)	184.4 (1,383, 54.4)	199.1 (1,493, 58.8)	213.3 (1,600, 63.0)	228.0 (1,710, 67.3)	228.0 (1,710, 67.3)
Normal threshold (kPa (mmHg, inHg))	147.6 (1,107, 43.6)	162.0 (1,215, 47.8)	176.7 (1,325, 52.2)	190.9 (1,432, 56.4)	205.6 (1,542, 60.7)	205.6 (1,542, 60.7)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	< Map 10

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

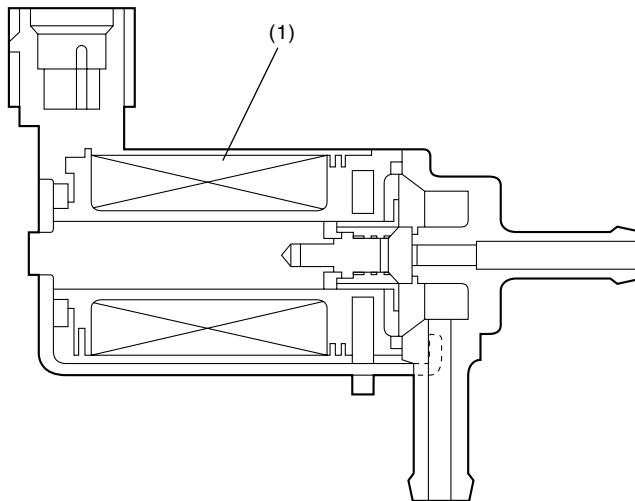
None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

**2. COMPONENT DESCRIPTION**

EN-01772

(1) Coil

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis continuously after engine starts.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when terminal output voltage is Low	< 75%

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Terminal output voltage	High

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

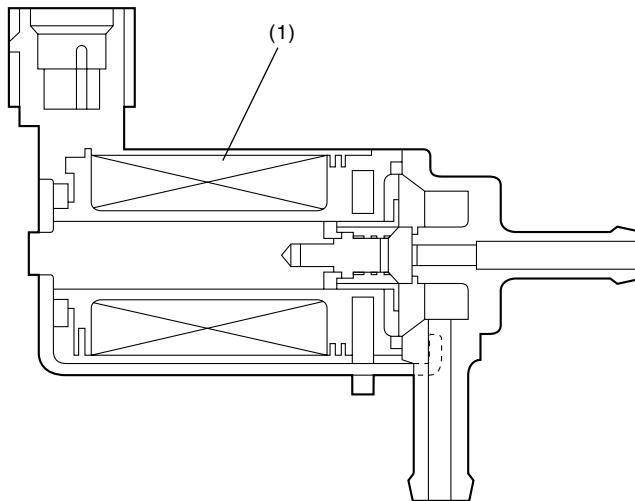
None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

**2. COMPONENT DESCRIPTION**

EN-01772

(1) Coil

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis continuously after engine starts.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when output terminal voltage is High	> 25%

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

#### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not operating
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℥ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	500 — 7,000 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V
All secondary parameters approval	≥ 1 second

#### Map3

##### Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, , 13.9)	51.1 (383, 15.1)

##### Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, , 8.96)	35.6 (267.4, , 10.5)	38.5 (288.9, , 11.4)	40.4 (302.9, , 11.9)	41.1 (308.6, , 12.1)	40.8 (306, 12.0)	44.8 (335.8, , 13.2)	47.3 (354.5, , 14.0)	49.1 (368.2, , 14.5)	50.9 (381.9, , 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

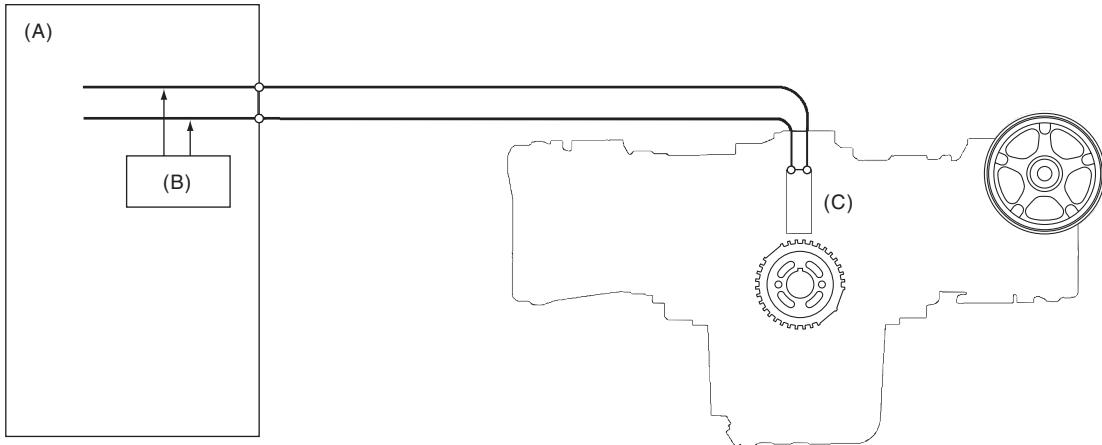
#### 3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
- Perform the diagnosis continuously.

## Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

#### 4. DIAGNOSTIC METHOD



EN-01773

- (A) Engine control module (ECM)
- (B) Diagnosis circuit
- (C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

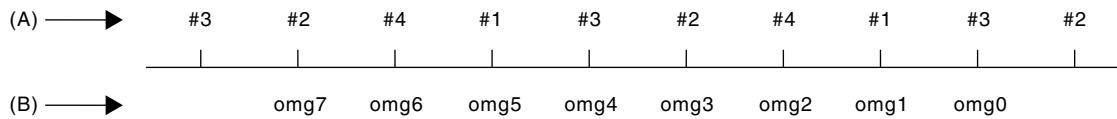
Calculate the diagnostic value (from crankshaft position speed)

- Misfire detection every single ignition (Compare diagnostic value with judgment value)
  - 180° Interval Difference Method
  - 360° Interval Difference Method
  - 720° Interval Difference Method
- NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
  - FTP1.5 times misfire NG judgment
  - Catalyst damage misfire NG judgment

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774

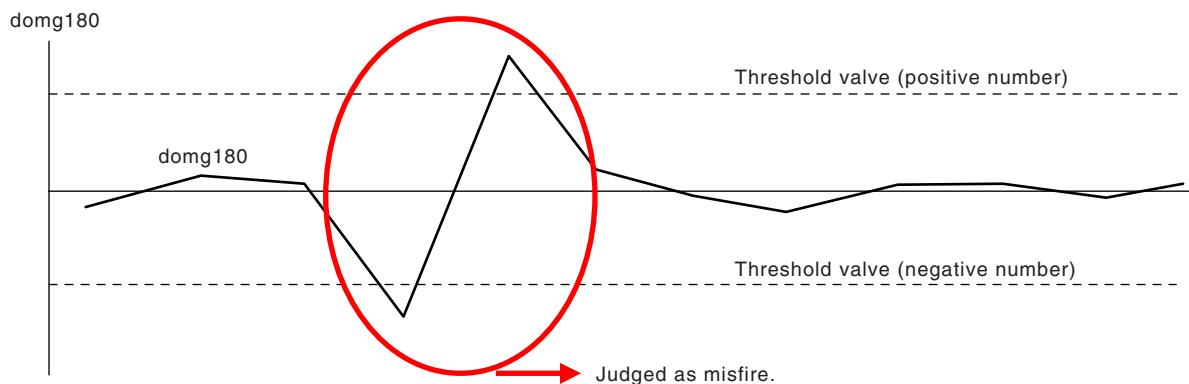
(A) Ignition order  
(B) Crankshaft position speed

### • 180° Interval Difference Method

Diagnosis value  $domg180 = (omg1 - omg0) - (omg7 - omg1)/6$

Judge misfire occurs in the following cases.

- $domg180 >$  judgment value of positive side
- $domg180 \leq$  judgment value of negative side  
(judgment value before 180°CA)



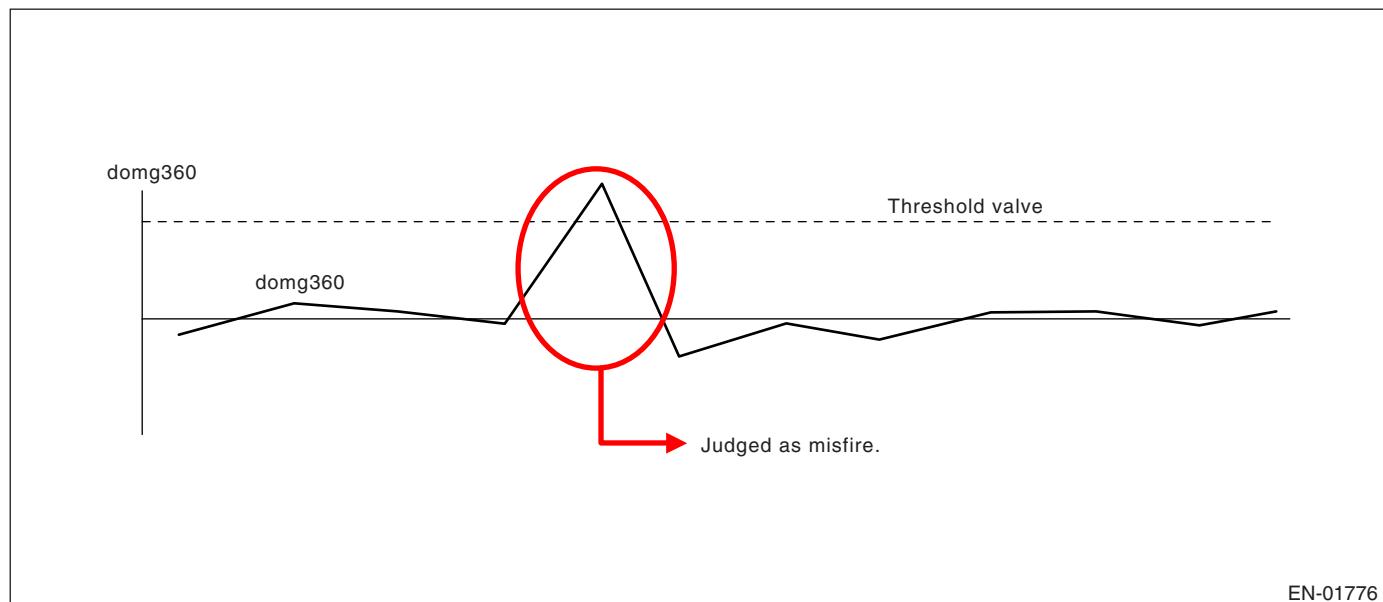
EN-01775

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 360° Interval Difference Method

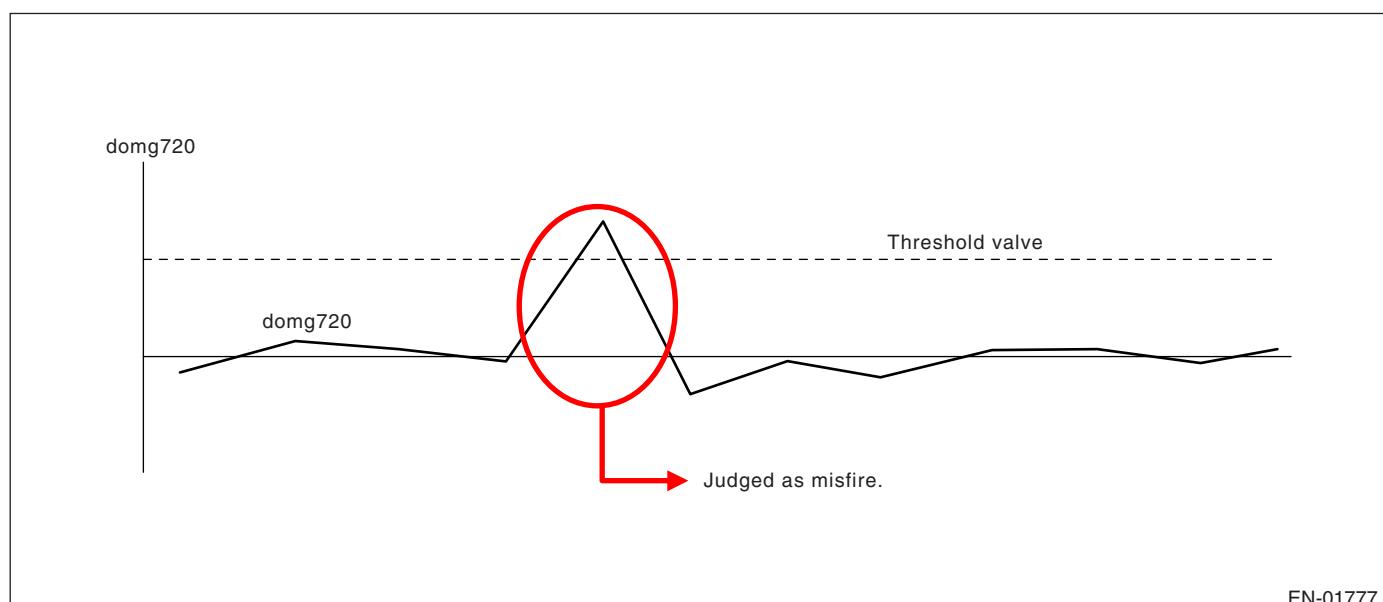
Diagnosis value  $domg\ 360 = (omg\ 1 - omg\ 0) - (omg\ 4 - omg\ 3)$   
Misfire judgment  $domg\ 360 > judgment\ value \rightarrow \text{Misfire occurs}$



EN-01776

### • 720° Interval Difference Method

Diagnosis value  $domg\ 720 = (omg\ 1 - omg\ 0) - (omg\ 7 - omg\ 6)$   
Misfire judgment  $domg\ 720 > judgment\ value \rightarrow \text{Misfire occurs}$



EN-01777

### • FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)**

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1,000 revs.

**Time Needed for Diagnosis:** 1,000 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))**

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

**Map 1 Fault criteria threshold for misfire which would result in catalyst damage**

Percentage	Intake air (g/gev.)												
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Engine speed (rpm)	1000	45.8	45.8	37.5	33.3	25.0	23.8	—	—	—	—	—	—
	1500	43.7	38.5	31.3	27.3	21.3	20.1	—	—	—	—	—	—
	2000	41.7	31.3	25.0	21.3	17.5	16.5	15.5	14.3	12.0	6.8	5.0	—
	2500	38.5	27.5	21.3	17.8	14.3	12.4	10.6	9.7	9.2	7.5	6.3	5.0
	3000	35.4	23.8	17.5	14.3	11.1	8.4	5.6	5.0	5.0	6.4	6.0	5.0
	3500	25.0	22.5	14.3	12.2	10.1	8.4	6.7	6.2	5.8	5.8	5.6	5.0
	4000	—	21.3	11.1	10.1	9.1	8.4	7.7	7.4	7.1	5.0	5.0	5.0
	4500	—	19.0	12.3	10.9	9.6	9.2	8.9	7.7	6.5	5.0	5.0	5.0
	5000	—	16.7	13.4	11.7	10.0	10.0	10.0	8.0	5.9	5.1	5.0	5.0
	5500	—	16.1	12.0	10.6	9.2	8.8	8.4	6.3	5.0	5.0	5.0	5.0
	6000	—	15.5	10.6	9.5	8.3	7.5	6.7	5.0	5.0	5.0	5.0	5.0
	6500	—	15.5	10.0	9.2	8.2	7.3	5.9	5.0	5.0	5.0	5.0	—
	7000	—	15.0	9.5	9.0	7.5	6.5	5.0	5.0	5.0	5.0	—	—

EN-03266

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means  $400 \text{ (ignition)} \times 22.5 \text{ (\%)} = 90 \text{ (ignition)}$  or more, so this case is judged misfire.

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

#### **1. OUTLINE OF DIAGNOSIS**

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

#### **1. OUTLINE OF DIAGNOSIS**

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

#### **1. OUTLINE OF DIAGNOSIS**

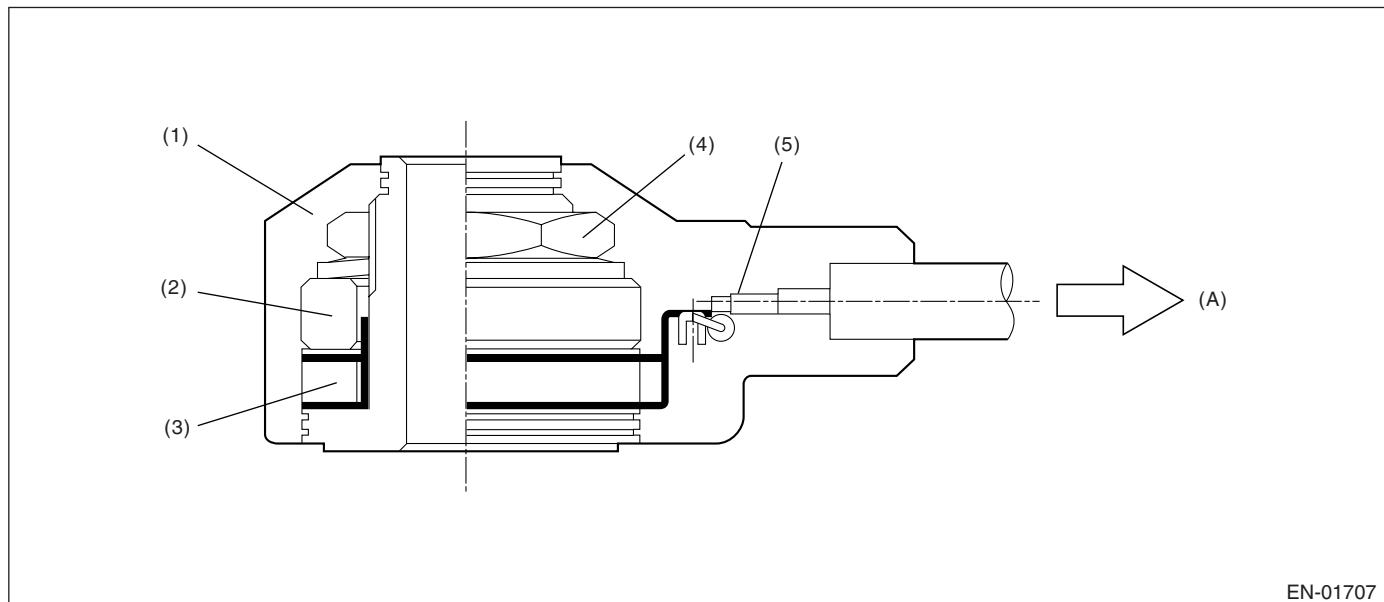
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(1)	Case	(A)	To knock sensor harness
(2)	Weight		
(3)	Piezoelectric element		
(4)	Nut		
(5)	Resistance		

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.238$ V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation =  $0^\circ$ CA is fixed.
  - At trouble: knock compensation =  $-5^\circ$ CA. (Retard  $5^\circ$ CA.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.

## 9. ECM OPERATION AT DTC SETTING

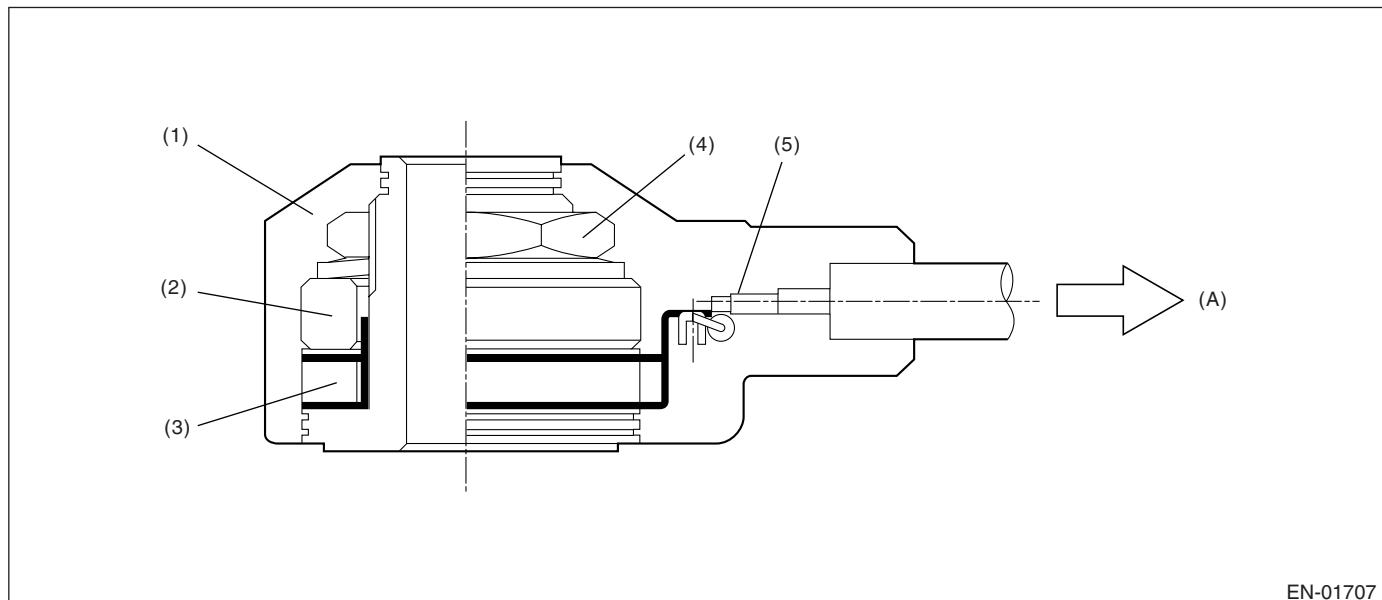
Memorize the freeze frame data. (For test mode \$02)

## AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(1)	Case	(A)	To knock sensor harness
(2)	Weight		
(3)	Piezoelectric element		
(4)	Nut		
(5)	Resistance		

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.714$ V
Ignition switch	ON

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°C A is fixed.
- At trouble: knock compensation = -5°C A. (Retard 5°C A.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

## 9. ECM OPERATION AT DTC SETTING

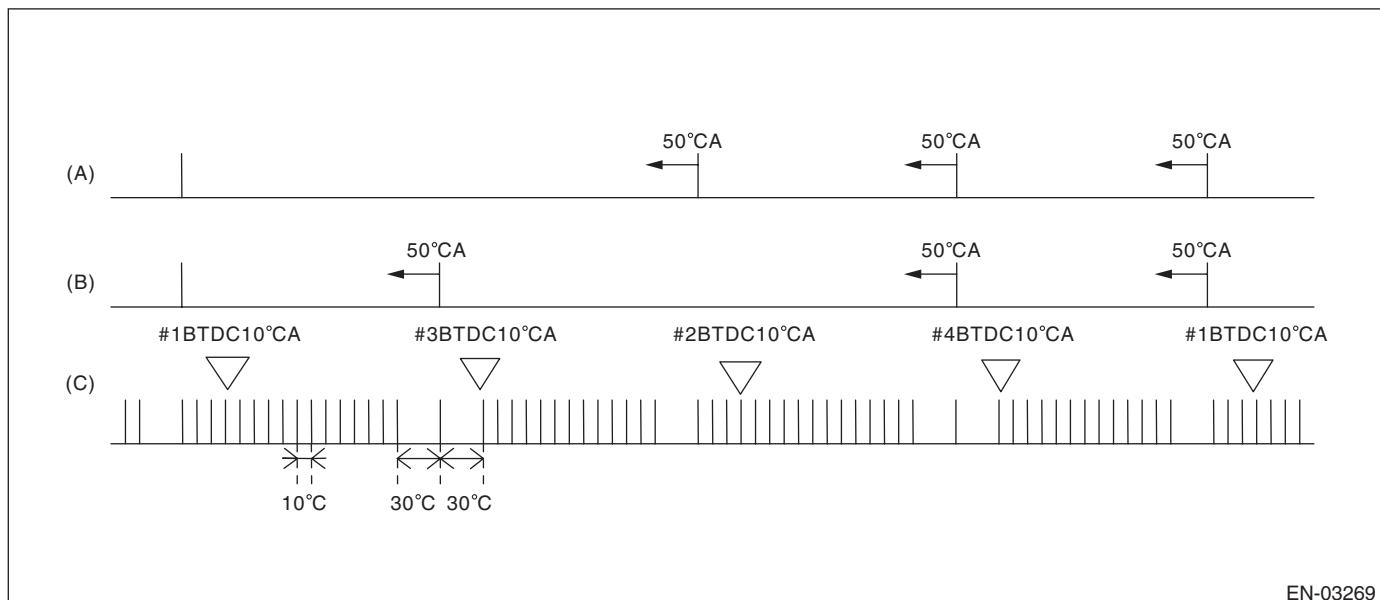
Memorize the freeze frame data. (For test mode \$02)

### AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

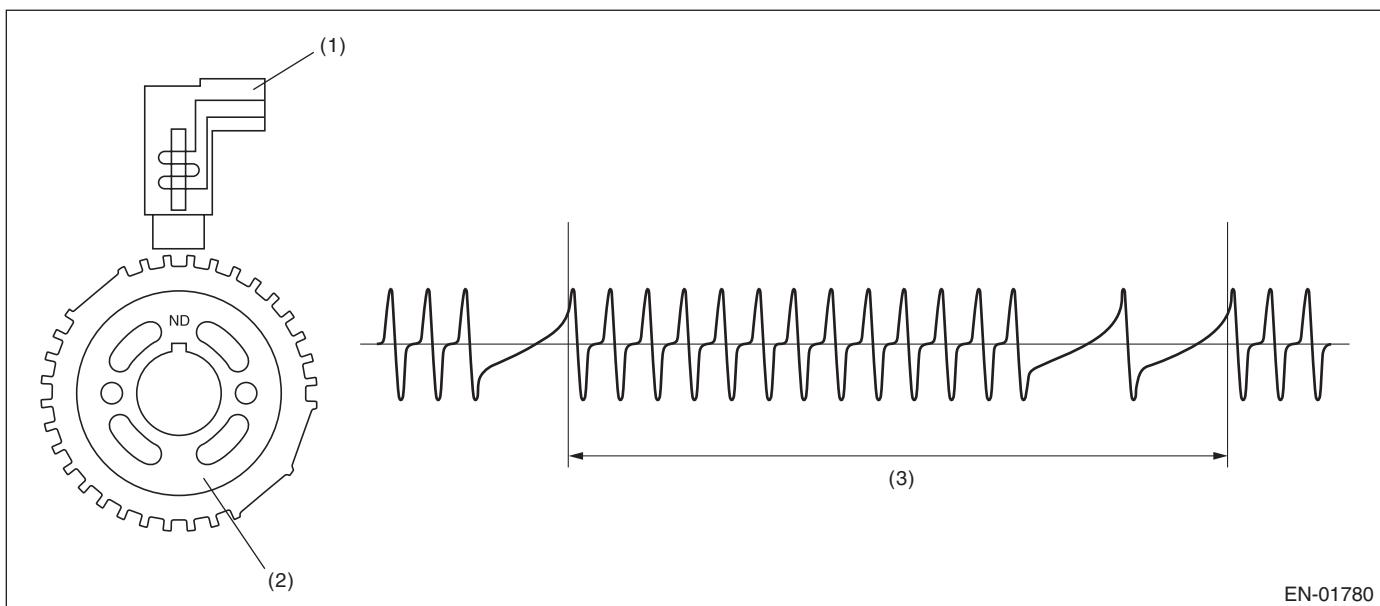
#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

#### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8$ V

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8$ V

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

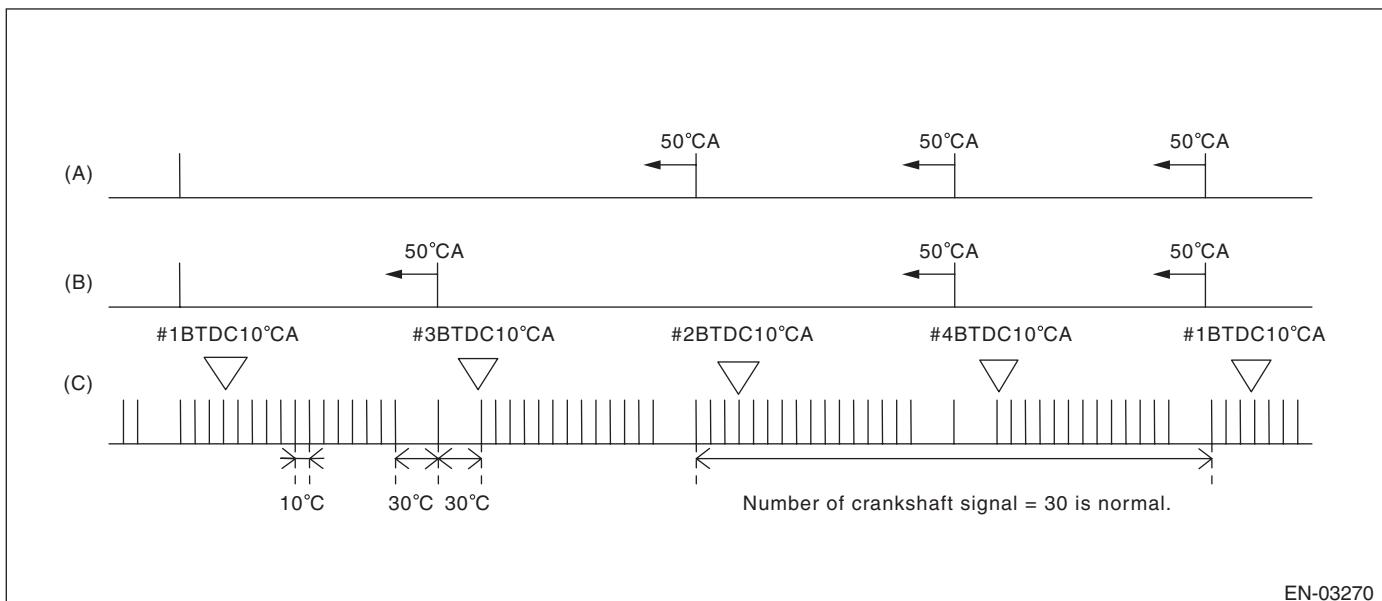
Memorize the freeze frame data. (For test mode \$02)

### AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

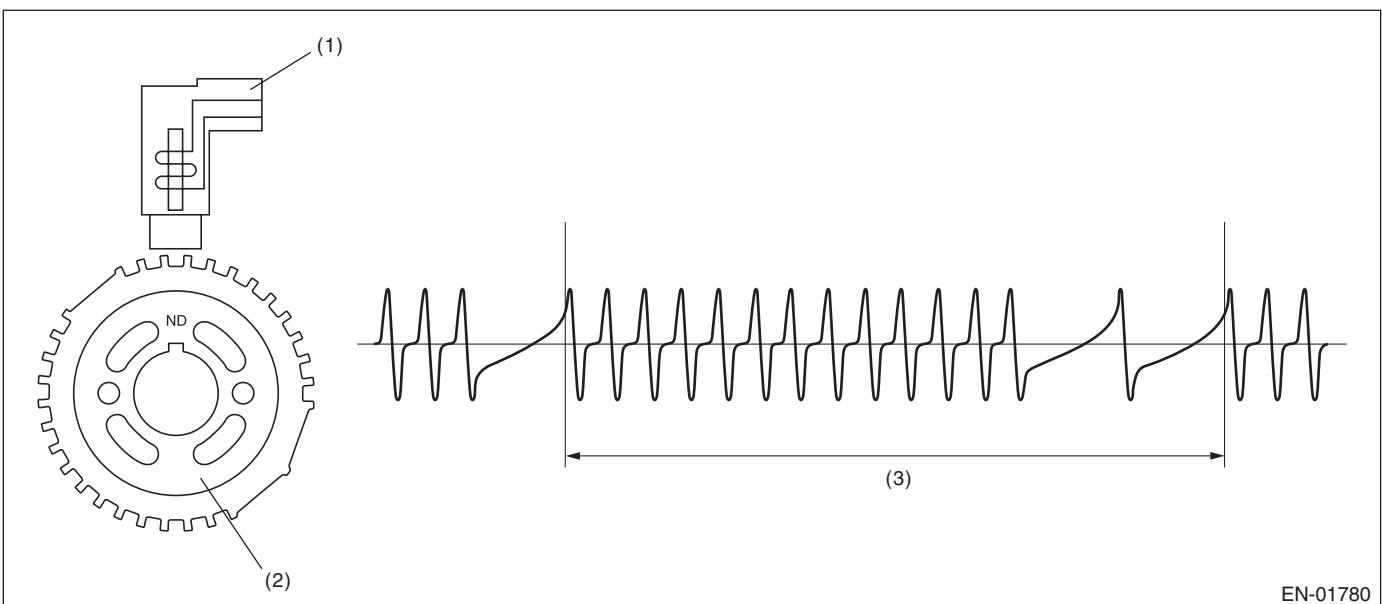
#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

#### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8$ V
Engine speed	$< 3,000$ rpm

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

#### Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

**Time Needed for Diagnosis:** 10 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

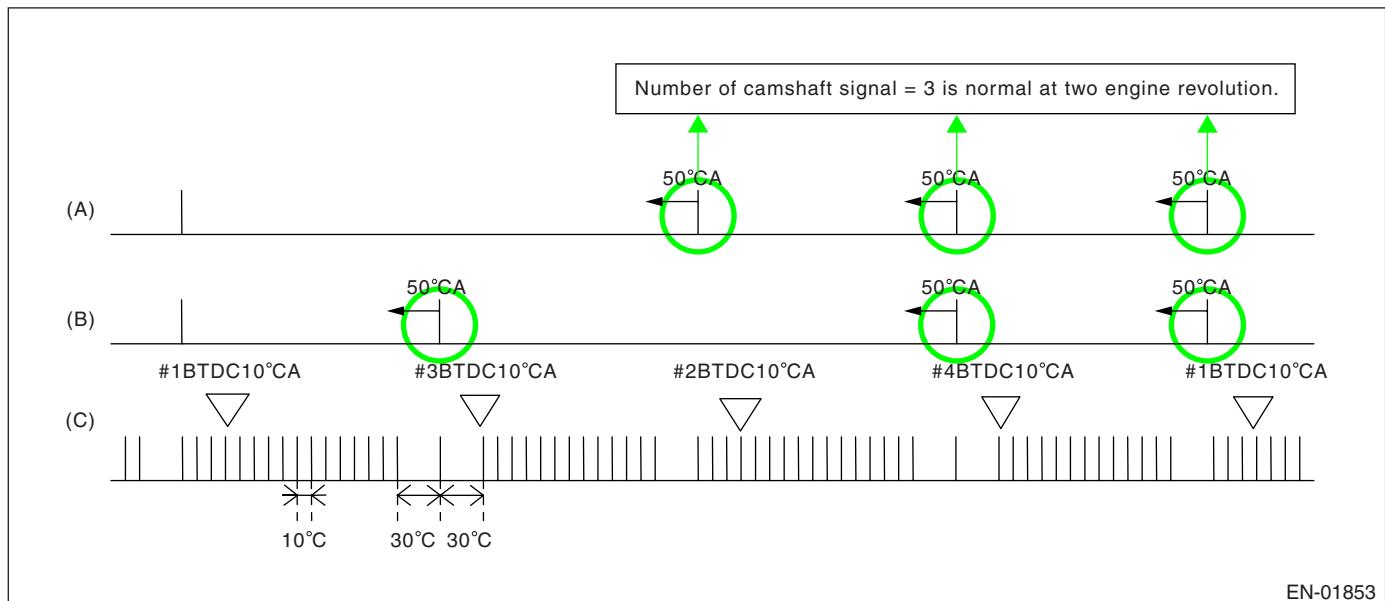
Memorize the freeze frame data. (For test mode \$02)

### AX:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

#### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 8$ V

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment 1

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 rev.	Except 3

**Time Needed for Diagnosis:** 100 rev.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Abnormality Judgment 2

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Camshaft angle signal	None

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Exists

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AY:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(STi)-111, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

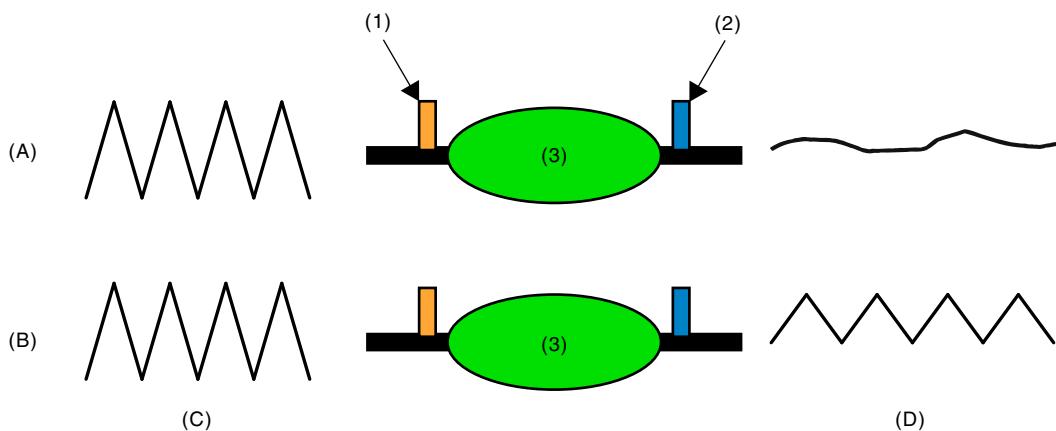
### AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

#### 2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration
- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen sensor waveform

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Catalyst deterioration diagnosis	Not finished
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 7,600
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1,000 milliseconds or more
Vehicle speed	≥ 75 km/h (46.6 MPH)
Amount of intake air	10 ←→ 40 g/s
Engine load change every 0.5 engine revs.	< 0.03 g/rev
Rear O <sub>2</sub> output change from below 600 mV to over	Experienced after fuel cut
After engine starting	≥ 150 seconds

#### • Map 2

Add the following value every 512 milliseconds.

#### Catalyst warm-up counter ≤ 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	-20	-8	15	36	57	79	100	121	127	127	127	127

#### Catalyst warm-up counter > 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	-2	-1	5	7	8	9	11	12	13	13	13	13

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

### 5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

### Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds $\times 4$ divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds $\times 4$	$\geq$ Map 3

### Map 3

Diagnosis value	0.1	0.162	0.214	0.266	0.318
Judgment value	4.51	4.51	10.45	16.39	22.34

**Time Needed for Diagnosis:** 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

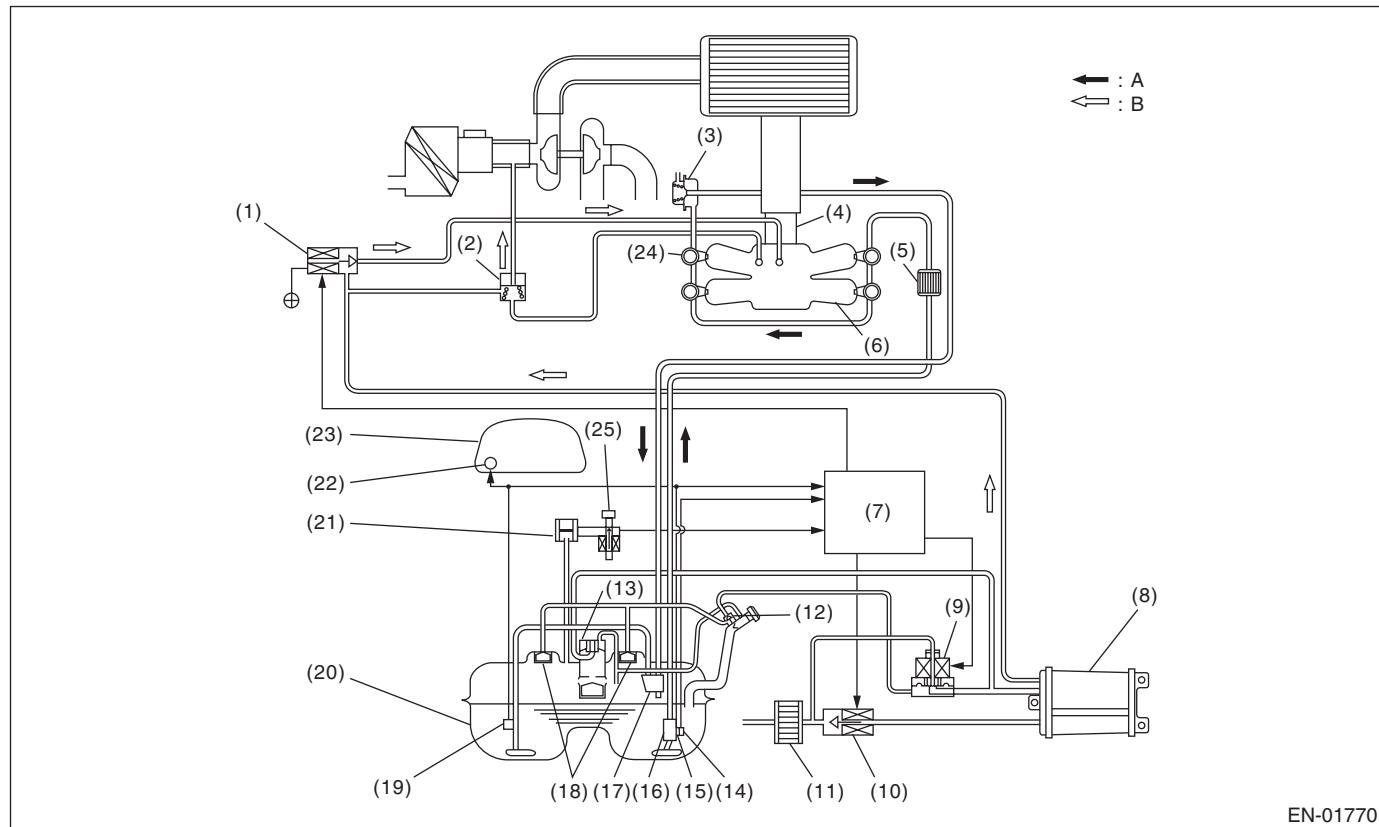
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

#### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



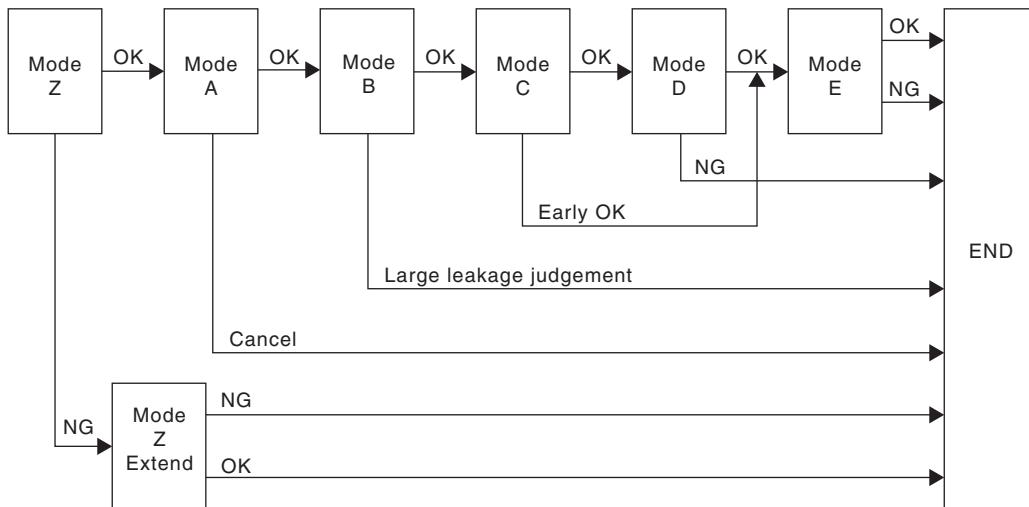
(1)	Purge control solenoid valve	(14)	Fuel temperature sensor
(2)	Purge valve	(15)	Fuel level sensor
(3)	Pressure regulator	(16)	Fuel pump
(4)	Throttle body	(17)	Jet pump
(5)	Fuel filter	(18)	Fuel cut valve
(6)	Intake manifold	(19)	Fuel sub level sensor
(7)	Engine control module (ECM)	(20)	Fuel tank
(8)	Canister	(21)	Fuel tank pressure sensor
(9)	Pressure control solenoid valve	(22)	Fuel meter
(10)	Drain valve	(23)	Combination meter
(11)	Drain filter	(24)	Fuel injector
(12)	Shut-off valve	(25)	Tank pressure switching solenoid valve
(13)	Vent valve		

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 0.04-inch Diagnosis



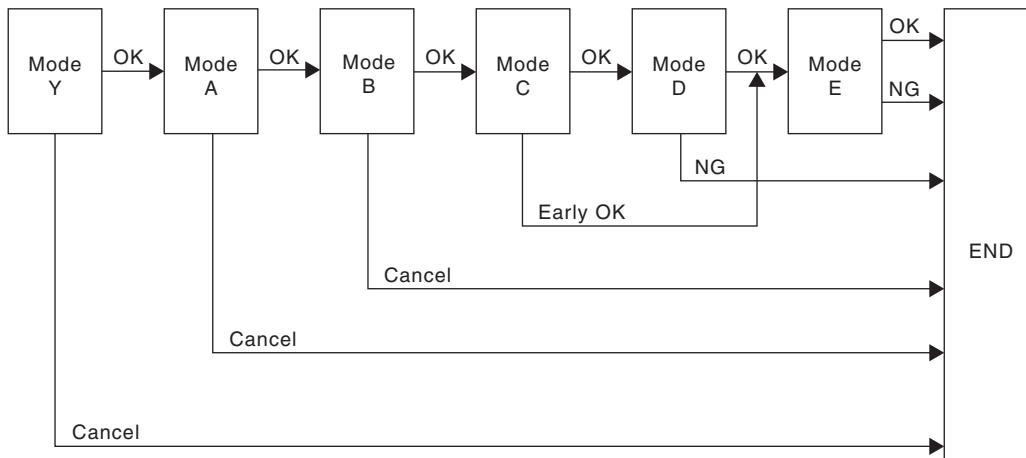
EN-01850

Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis, CCV abnormal close diagnosis)	Carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount after diagnosis started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	4 — 35 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	4 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	12 — 16 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis completed.	4 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 0.02-inch Diagnosis



EN-01872

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 20 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	20 — 25 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis completed.	4 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Mode Table for Evaporative Emission Control System Diagnosis

#### 0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
		CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in.)].	P0442
		P2 measurement of small leak in system. EVAP. system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property	P1443

#### 0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere	—	—
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	—	—
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

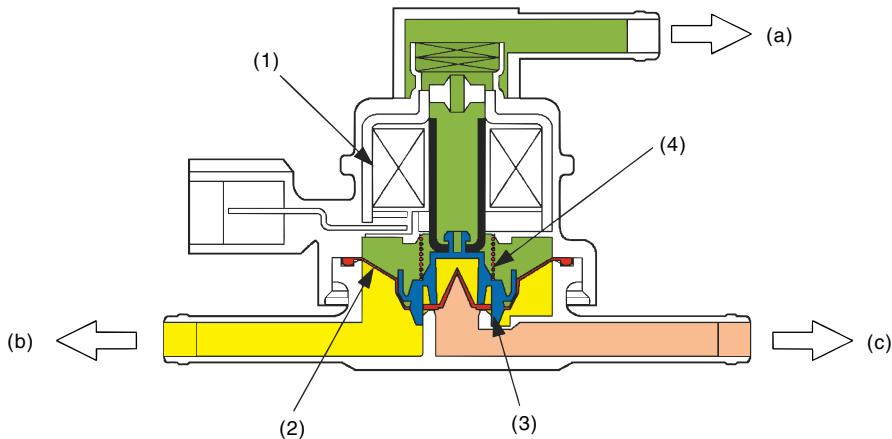
### 2. COMPONENT DESCRIPTION

#### • Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The solenoid which is set to ON forces to open the valve.



EN-01715

(1)	Solenoid	(a)	Atmospheric pressure
(2)	Diaphragm	(b)	Fuel tank
(3)	Valve	(c)	Canister
(4)	Spring		

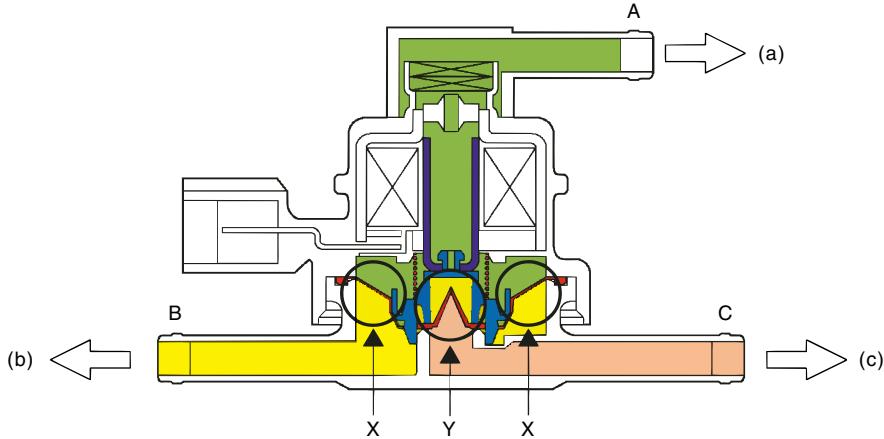
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

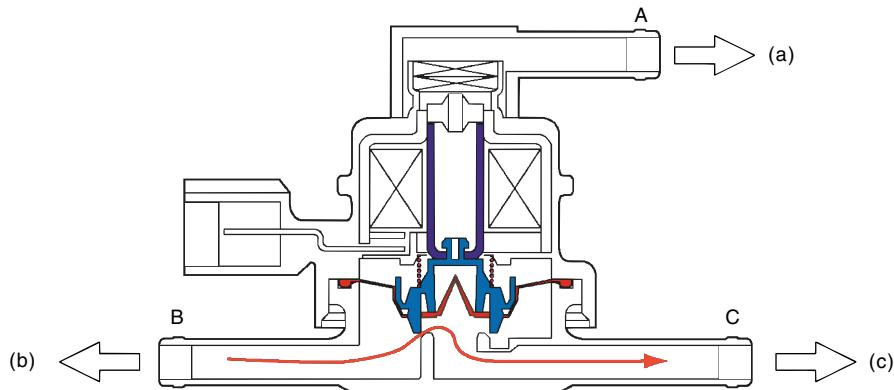
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Condition of pressure	Flow
$A < B$ (solenoid OFF)	$B \rightarrow C$
$B < C$ (solenoid OFF)	$C \rightarrow B$
Solenoid ON	$B \leftrightarrow C$

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

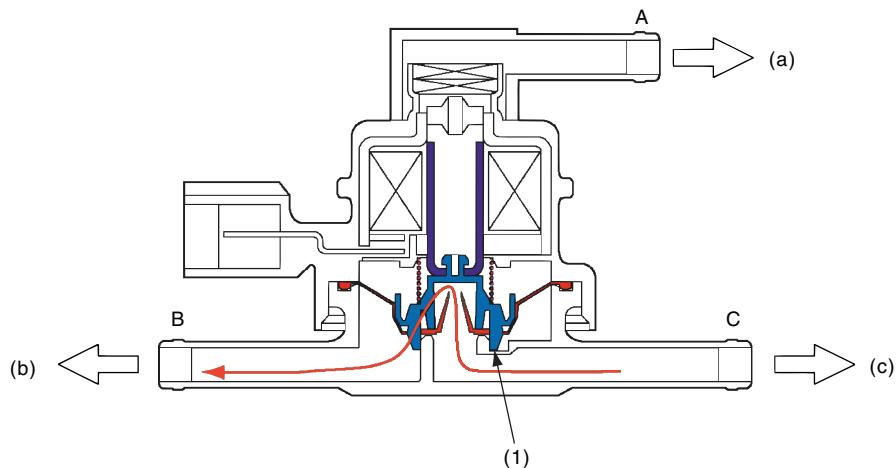
- When A < B (Solenoid OFF)



EN-01717

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

- When B < C (Solenoid OFF)



EN-01718

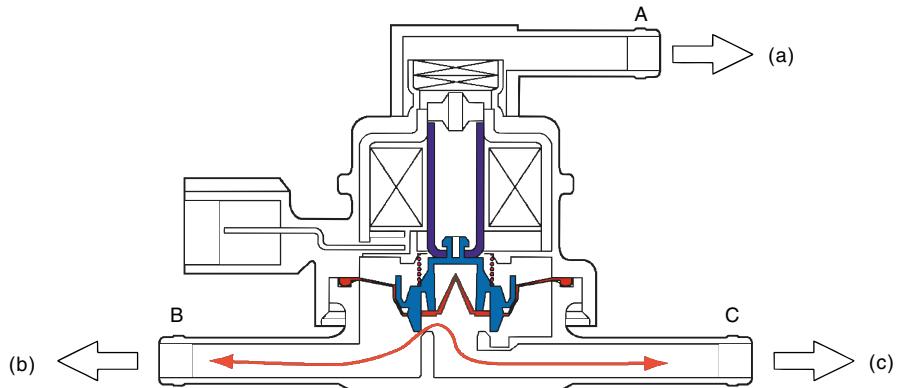
- (1) Valve

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

- When Solenoid is ON



EN-01719

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

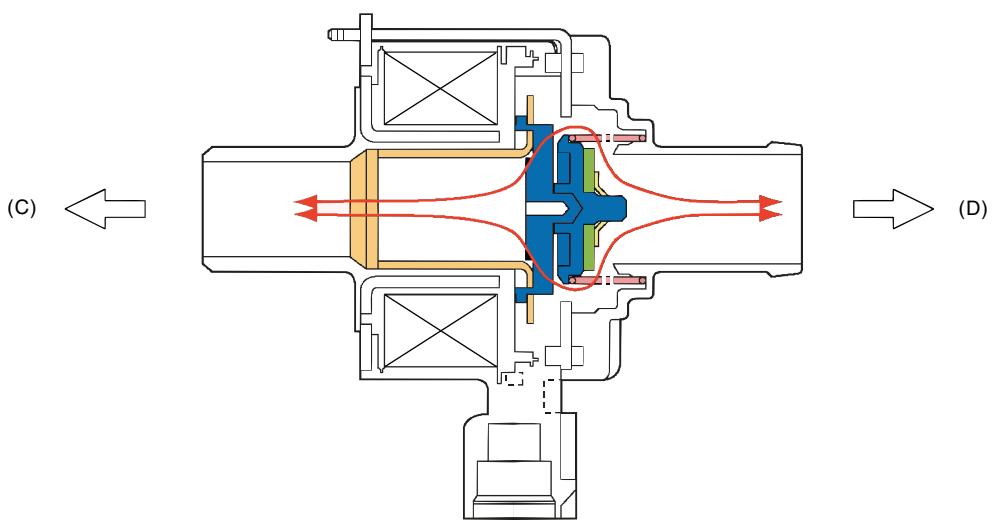
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

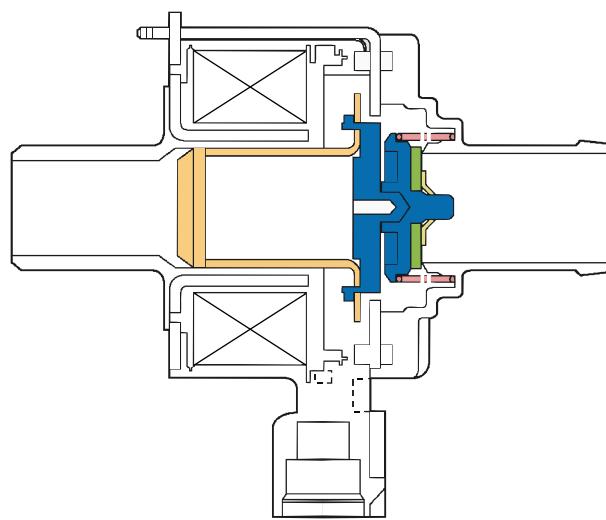
### • CCV

CCV controls the ambient air to be introduced to the canister.

(A)



(B)

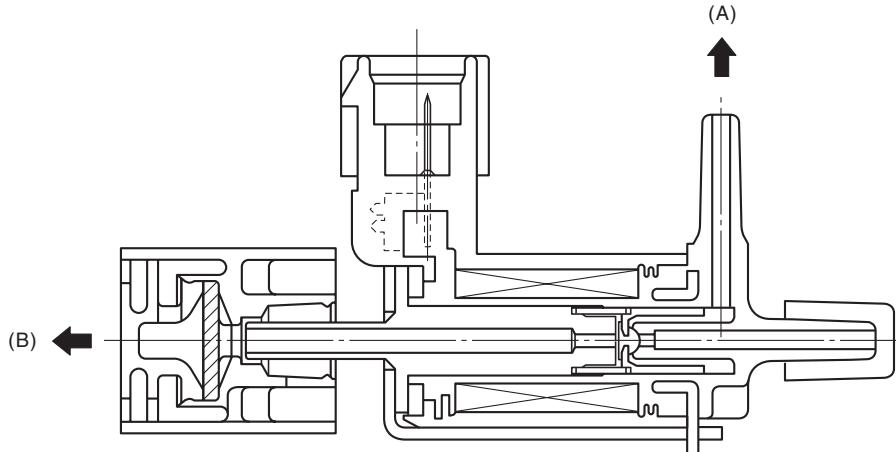


EN-01720

- (A) Open (Solenoid OFF)
- (B) Close (Solenoid ON)
- (C) Filter
- (D) Canister

### • Tank Pressure Switching Solenoid

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON closes the passage open to atmosphere.



EN-01721

(A) Fuel tank pressure sensor

(B) Atmosphere

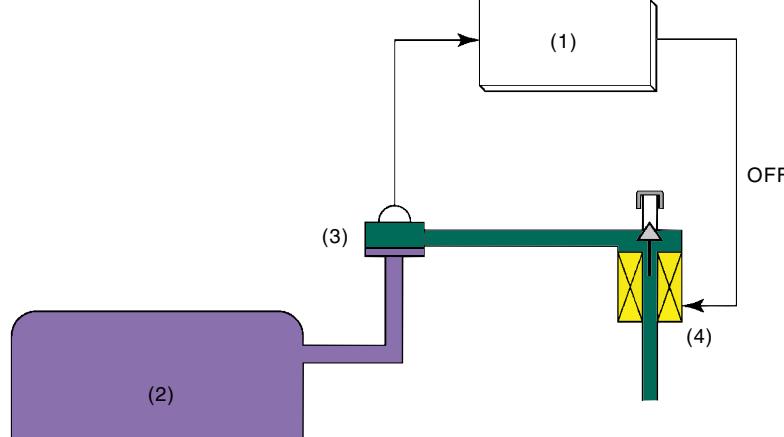
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



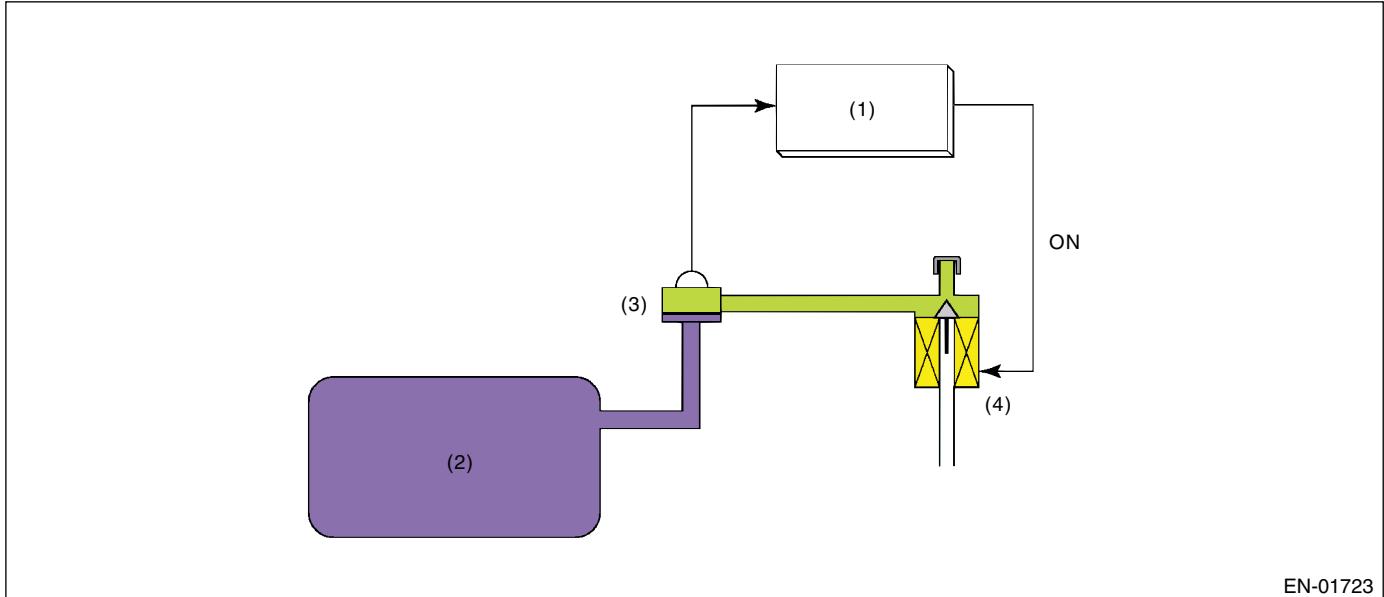
EN-01722

- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

### NOTE:

ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.

In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### 0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Evaporation diagnosis	Incomplete
Battery voltage	$\geq 10.9$ V
Barometric pressure	$\geq 75.1$ kPa (563 mmHg, 22.2 inHg)
Accumulated time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	$\leq 0.04$
Engine speed	1,050 $\longleftrightarrow$ 6,500 rpm
Fuel tank pressure	-4.0 — 1.03 kPa (-30 — 7.72 mmHg, -1.2 — 0.30 inHg)
Intake manifold vacuum (relative pressure)	$< -13.3$ kPa (-100 mmHg, -3.92 inHg)
Vehicle speed	$\geq 32$ km/h (20 MPH)
Fuel level	9 $\longleftrightarrow$ 51 l (2.38 $\longleftrightarrow$ 13.5 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	-10 $\longleftrightarrow$ 45°C (14 $\longleftrightarrow$ 113°F)
Intake air temperature	$\geq -10$ °C (14°F)
Pressure change per second	$< 0.13$ kPa (0.95 mmHg, 0.04 inHg)
Min. pressure change per second – Max. pressure change per second	$< 0.23$ kPa (1.75 mmHg, 0.07 inHg)
Fuel level change	$< 2.5$ l (0.66 US gal, 0.55 Imp gal)/128 milliseconds
Air fuel ratio	0.76 — 1.25

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
EVAP. diagnosis	Incomplete
Battery voltage	$\geq 10.9$ V
Atmospheric pressure	$\geq 75.1$ kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	$\geq 120$ seconds
Accumulated time of canister purge operation	120 second or more
After engine starting	335 second or more
Fuel temperature	$-10 \leftrightarrow 35$ °C (14 $\leftrightarrow$ 95°F)
Or engine coolant temperature at engine start	$< 45$ °C (113°F)
And time after engine start	$< 2,400$ seconds
Fuel level	$9 \leftrightarrow 51$ l (2.38 $\leftrightarrow$ 13.5 US gal, 1.98 $\leftrightarrow$ 11.2 Imp gal)
(Ambient – fuel) temperature	$< 1$ °C (1.8°F)
Fuel tank pressure below $-3.01$ kPa ( $-22.8$ mmHg, $-0.88$ inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	$< -13.3$ kPa ( $-100$ mmHg, $-3.92$ inHg)
Fuel tank pressure	$-0.13 \rightarrow 0.91$ kPa ( $-1 \rightarrow 6.8$ mmHg, $-0.04 \rightarrow 0.27$ inHg)
Vehicle speed	$\geq 68$ km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1,500 $\leftrightarrow$ 3,000 rpm
(During diagnosis)	
P1	$-0.13 \leftrightarrow 0.13$ kPa ( $-1 \leftrightarrow 1$ mmHg, $-0.04 \leftrightarrow 0.04$ inHg)
Pressure change per second	$< 0.13$ kPa (0.96 mmHg, 0.04 inHg)
Fuel level change	$1 \leftrightarrow 3$ l (0.3 $\leftrightarrow$ 0.8 US gal, 0.2 $\leftrightarrow$ 0.7 Imp gal)
Tank pressure	$< 1.03$ kPa (7.72 mmHg, 0.30 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	$< 0.23$ kPa (1.75 mmHg, 0.07 inHg) – $< 0.23$ kPa (1.75 mmHg, 0.07 inHg)
Change of atmospheric pressure during P1 calculation	$-0.04 \leftrightarrow 0.13$ kPa ( $-0.3 \leftrightarrow 1$ mmHg, $-0.01 \leftrightarrow 0.04$ inHg)
Change of atmospheric pressure during P2 calculation	$0 \leftrightarrow 0.12$ kPa (0 $\leftrightarrow 0.9$ mmHg, 0 $\leftrightarrow 0.04$ inHg)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. GENERAL DRIVING CYCLE

#### • 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.

- Pay attention to the fuel temperature and fuel level.

#### • 0.02-inch Diagnosis

- Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
- If not judged OK or NG, repeat the diagnosis until judged OK or NG.
- Pay attention to the fuel temperature and fuel level.

### 5. DIAGNOSTIC METHOD

#### • MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

DTC P0457

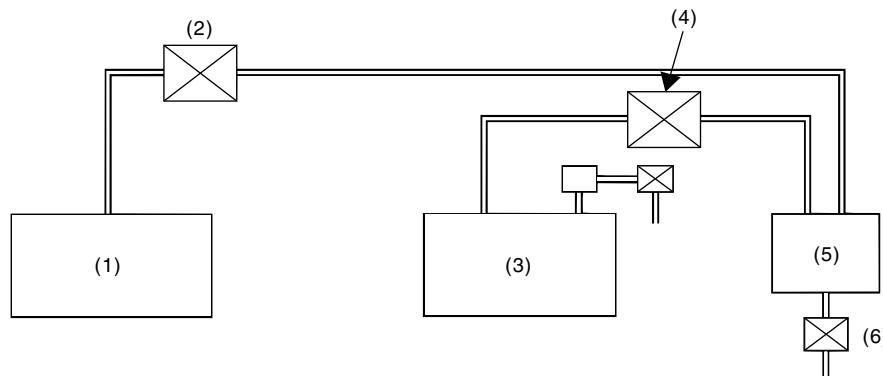
DTC P1443

#### • Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.

If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. In this status, the pressure control solenoid valve solenoid, which is set to ON, does not open the valve for its structure when the negative pressure is larger than electromagnetic force.

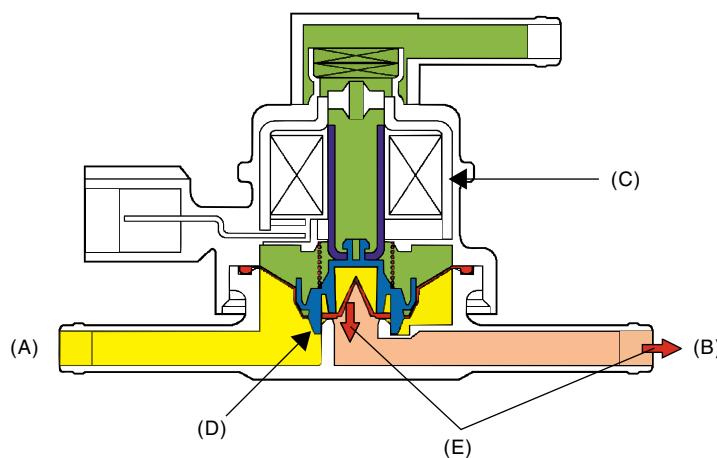


EN-01724

(1)	Engine	(4)	Pressure control solenoid valve close
(2)	Purge control solenoid valve open	(5)	Canister
(3)	Fuel tank	(6)	CCV stuck close

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

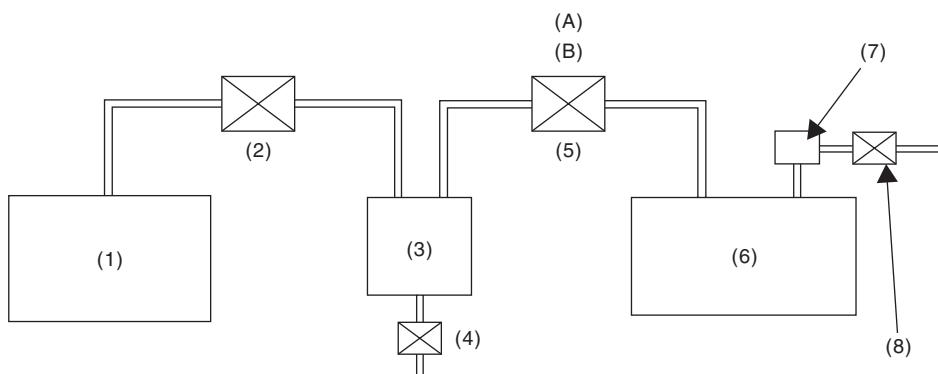


EN-01725

- (A) To fuel tank
- (B) To canister (Negative pressure)
- (C) Solenoid ON
- (D) Valve cannot be open.
- (E) Negative pressure

### • Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



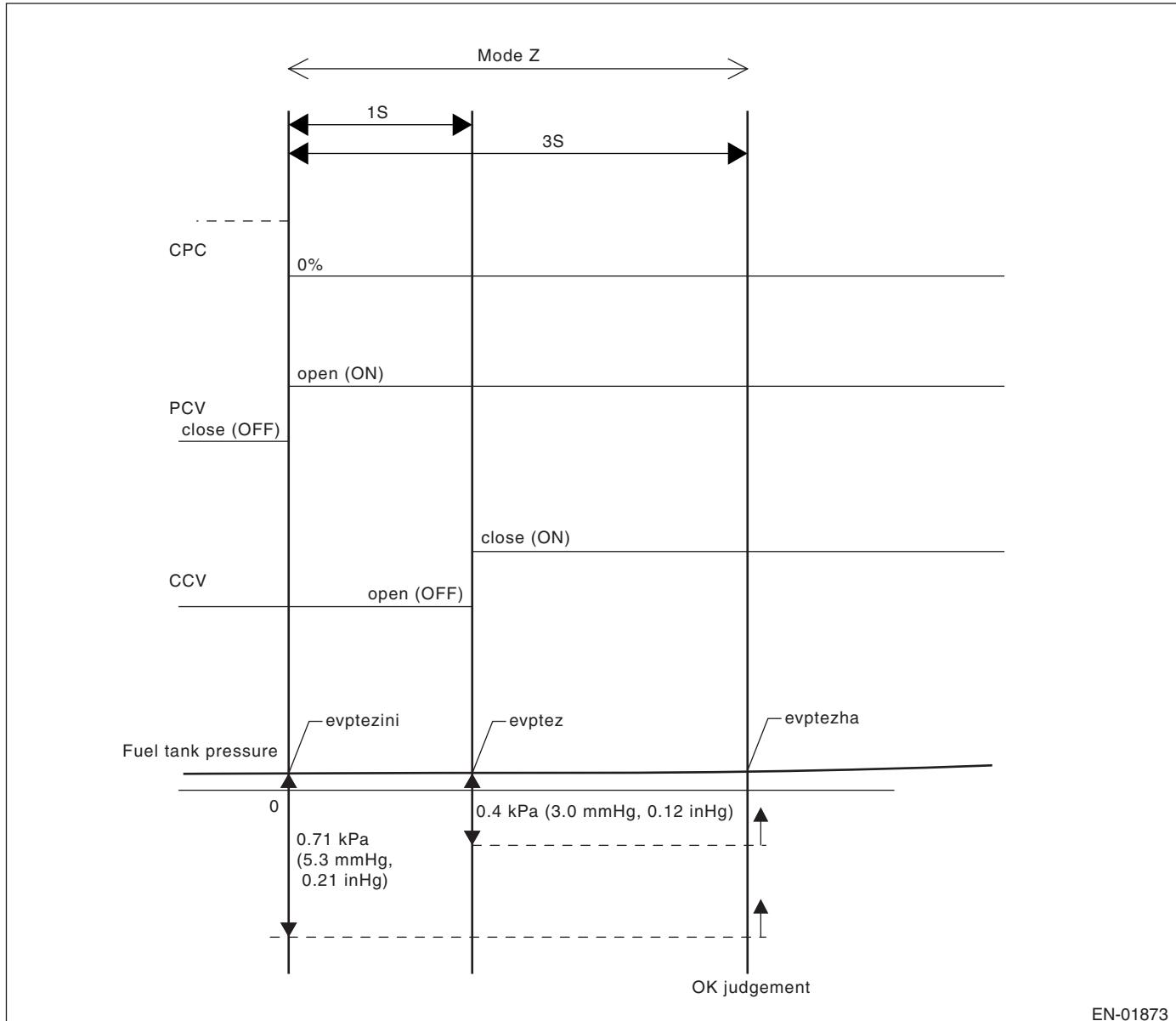
EN-01726

- (1) Engine
- (2) Purge control solenoid valve
- (3) Canister
- (4) Drain valve
- (5) Pressure control solenoid valve
- (6) Fuel tank
- (7) Fuel tank pressure sensor
- (8) Tank pressure switching solenoid valve

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Normal Operation



EN-01873

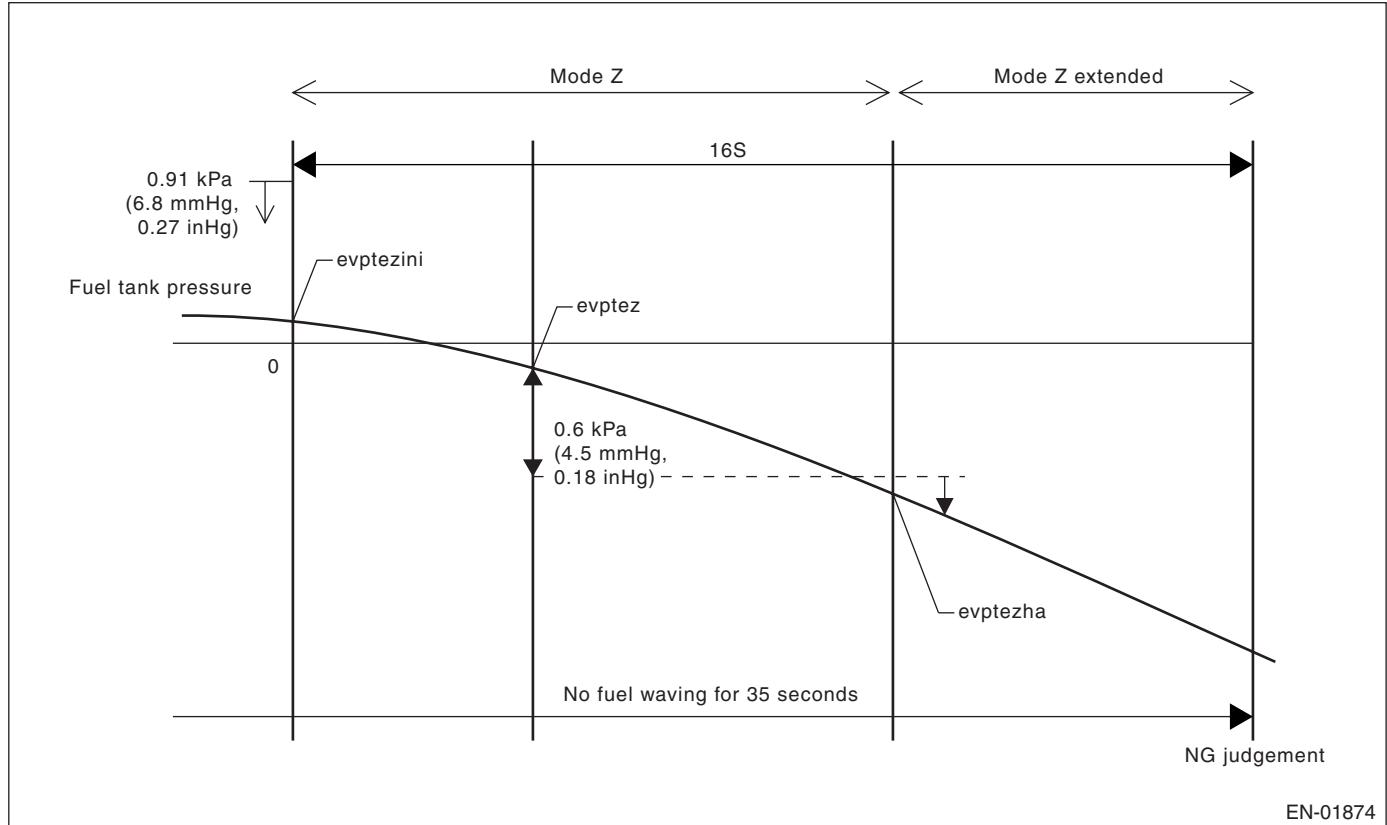
- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$
- $evptezi - evptezha \leq 0.71 \text{ kPa (5.3 mmHg, 0.21 inHg)}$

Judge normal when both of above calculations are completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Purge Control Solenoid Valve Open Fixation



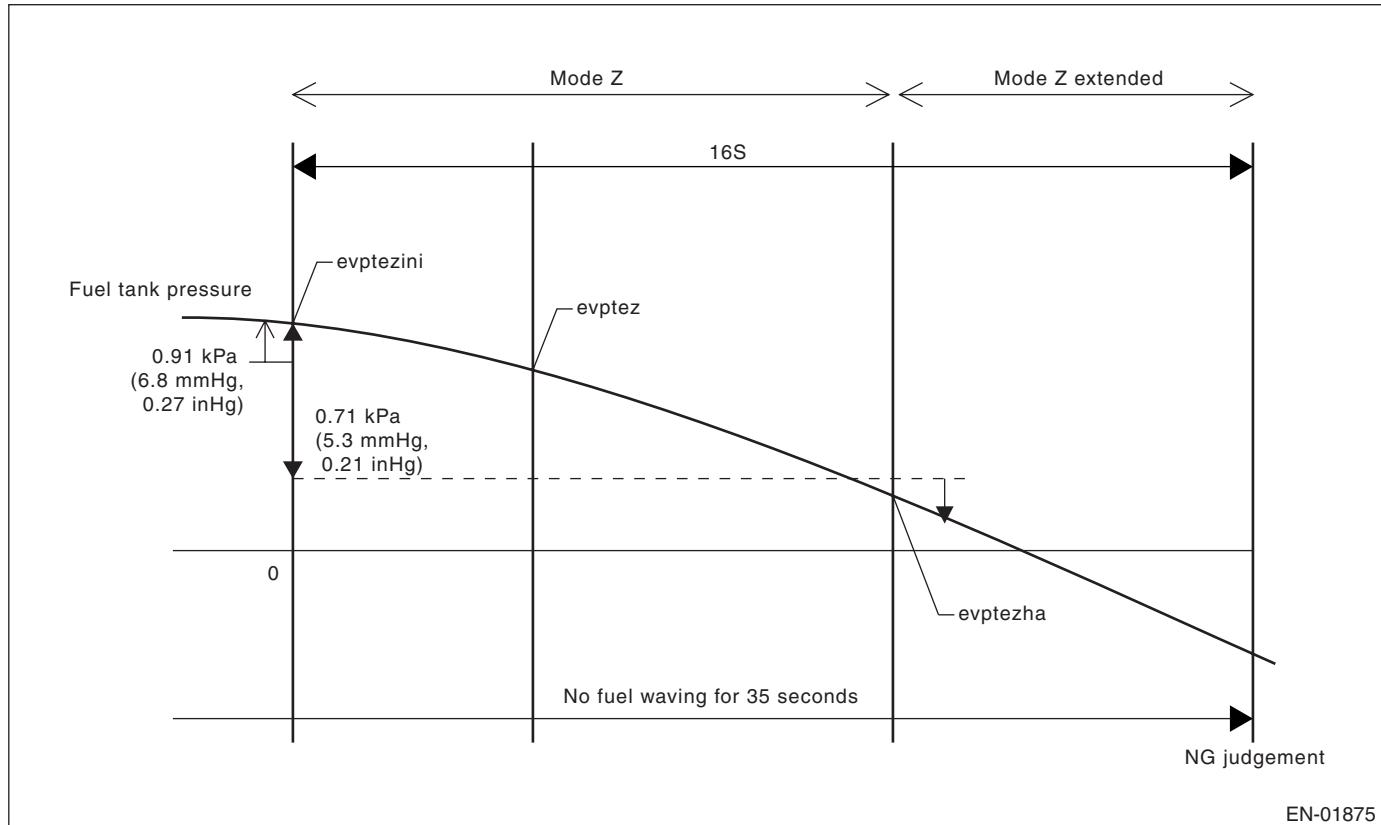
- $evptez - evptezha > 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$
- $evptezi \leq 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when both of above calculations are completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Drain Valve close fixation



- evptezini – evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds

Judge normal when both of above calculations are completed.

### • Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

#### Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

#### Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.7 kPa (5.3 mmHg, 0.21 inHg)	P0457

#### Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> 0.91 kPa (6.8 mmHg, 0.27 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.7 kPa (5.3 mmHg, 0.21 inHg)	
No fuel locking time	≥ 35 seconds	

**Time Needed for Diagnosis:** 16 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for drain valve close fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

### • Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

#### Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

Both diagnostic method and judgment value are the same as PCV normality judgment.

#### Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)	
No fuel locking time	≥ 35 seconds	

**Time Needed for Diagnosis:** 16 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

### • Leak Diagnosis

DTC P0442

DTC P0456

DTC P0457

#### • Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

#### Mode A; (Estimation of evaporation gas yield)

Calculate the tank pressure variation amount (P1). After calculating P1, change to Mode B.

#### Mode B; (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg) (0.04-in diagnosis)

Approx. 0 → -3.05 kPa (0 → -22.9 mmHg, 0 → -0.9 inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds or 25 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

#### Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Time for reaching desired negative pressure Or time for Mode B (Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started)	$\geq 25$ seconds $\geq 10$ seconds $< -0.5$ kPa ( $-4$ mmHg, $-0.16$ inHg)	P0457

### Mode C; (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until returning target pressure.)

When returning to target pressure, move to Mode D.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Target pressure	Time for immediate OK judgment
0.04-inch diagnosis	$-1.3$ kPa ( $-9.75$ mmHg, $-0.38$ inHg)	15 seconds
0.02-inch diagnosis	$-3$ kPa ( $-22.5$ mmHg, $-0.89$ inHg)	20 seconds

### Mode D; (Measurement of negative pressure changes)

Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

#### • After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

#### • 0.04-inch Diagnosis

#### Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

### Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – $1.5 \times P1$ P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	$>$ Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

\*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.90 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.90 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.60 mmHg, 0.26 inHg)

### • 0.02-inch Diagnosis

#### Abnormality Judgment

Judge NG when the criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

### Map 8 Limit of malfunction criteria for 0.02-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.56 kPa (4.19 mmHg, 0.16 inHg)	0.59 kPa (4.40 mmHg, 0.18 inHg)	0.62 kPa (4.66 mmHg, 0.18 inHg)	0.66 kPa (4.92 mmHg, 0.19 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.63 kPa (4.70 mmHg, 0.19 inHg)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.70 kPa (5.27 mmHg, 0.21 inHg)	0.79 kPa (5.89 mmHg, 0.23 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.69 kPa (5.20 mmHg, 0.20 inHg)	0.71 kPa (5.35 mmHg, 0.21 inHg)	0.78 kPa (5.87 mmHg, 0.23 inHg)	0.83 kPa (6.20 mmHg, 0.24 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.75 kPa (5.65 mmHg, 0.22 inHg)	0.78 kPa (5.83 mmHg, 0.23 inHg)	0.85 kPa (6.39 mmHg, 0.25 inHg)	0.88 kPa (6.58 mmHg, 0.26 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.81 kPa (6.10 mmHg, 0.24 inHg)	0.84 kPa (6.30 mmHg, 0.25 inHg)	0.92 kPa (6.90 mmHg, 0.27 inHg)	0.95 kPa (7.10 mmHg, 0.28 inHg)

#### Normality Judgment

Judge OK when the criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	> Value on map 9.	P0456

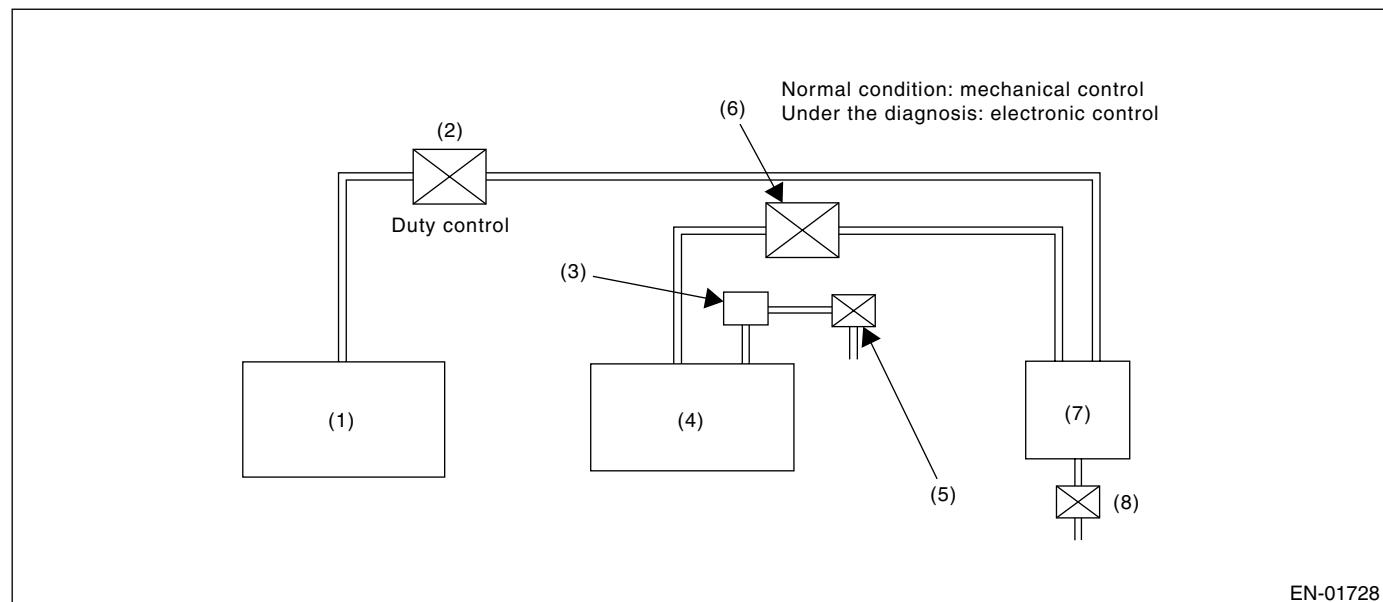
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 9.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	2.00 kPa (15.0 mmHg, 0.59 inHg)	3.33 kPa (25.0 mmHg, 0.98 inHg)	4.66 kPa (35.0 mmHg, 1.38 inHg)	5.33 kPa (40.0 mmHg, 1.57 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.36 kPa (2.69 mmHg, 0.11 inHg)	0.39 kPa (2.90 mmHg, 0.11 inHg)	0.42 kPa (3.16 mmHg, 0.12 inHg)	0.46 kPa (3.42 mmHg, 0.13 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.43 kPa (3.20 mmHg, 0.12 inHg)	0.45 kPa (3.38 mmHg, 0.13 inHg)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.59 kPa (4.39 mmHg, 0.17 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.49 kPa (3.70 mmHg, 0.15 inHg)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.58 kPa (4.37 mmHg, 0.17 inHg)	0.63 kPa (4.70 mmHg, 0.19 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.61 kPa (4.60 mmHg, 0.18 inHg)	0.64 kPa (4.80 mmHg, 0.19 inHg)	0.72 kPa (5.40 mmHg, 0.21 inHg)	0.75 kPa (5.60 mmHg, 0.22 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.

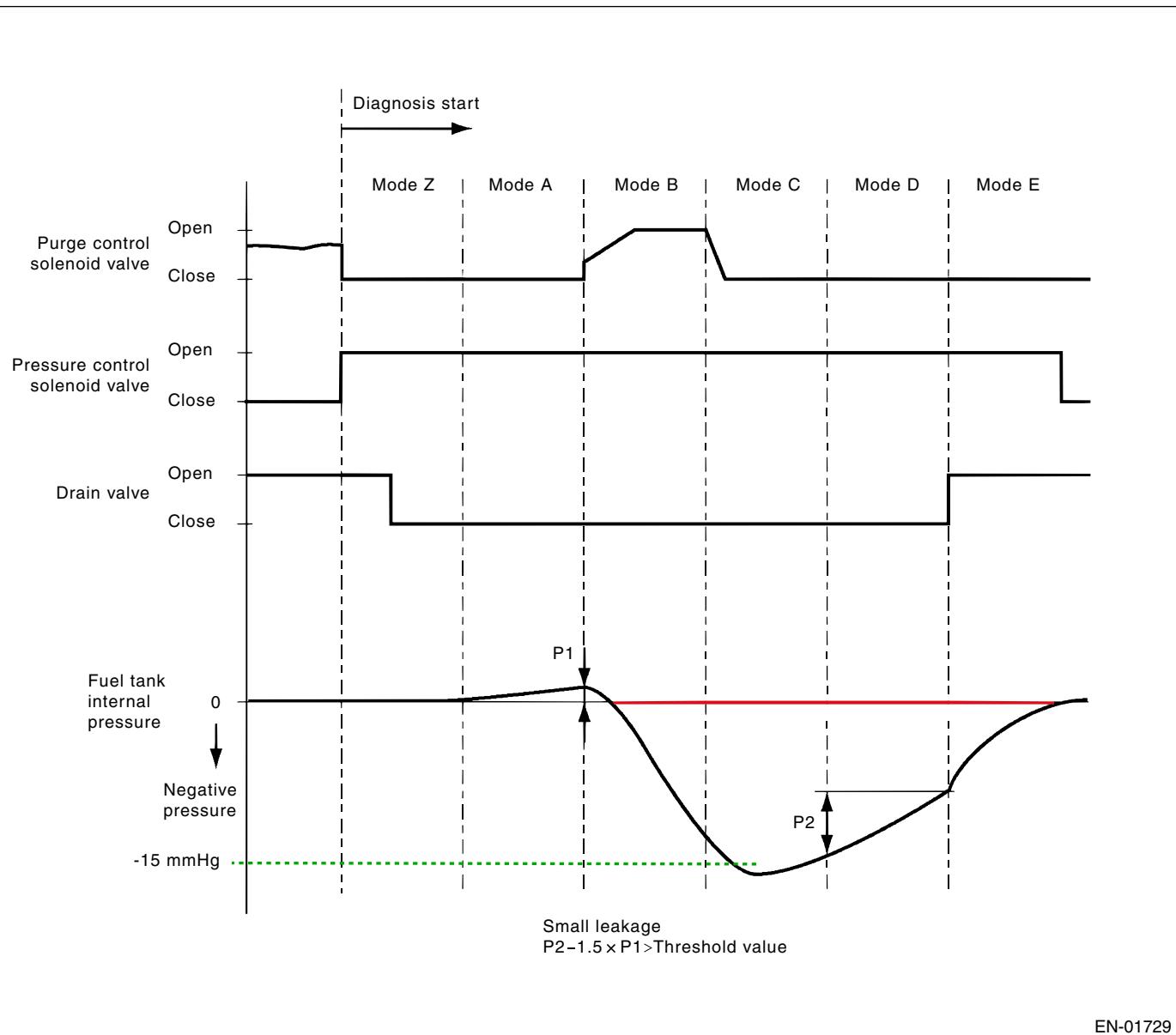


EN-01728

(1)	Engine	(5)	Atmospheric pressure switching solenoid
(2)	Purge control solenoid valve	(6)	Pressure control solenoid valve
(3)	Fuel tank pressure sensor	(7)	Canister
(4)	Fuel tank	(8)	Drain valve

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION



EN-01729

### • CCV Property Diagnosis [P1443]

#### Mode E;

The tank pressure must become again as high as the atmospheric air pressure after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.

Judge NG when the criteria below are completed.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 0.36 kPa (2.72 mmHg, 0.11 inHg)	P1443

#### Time Needed for Diagnosis:

0.04-inch: 50 — 70 seconds

0.02-inch: 90 — 105 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

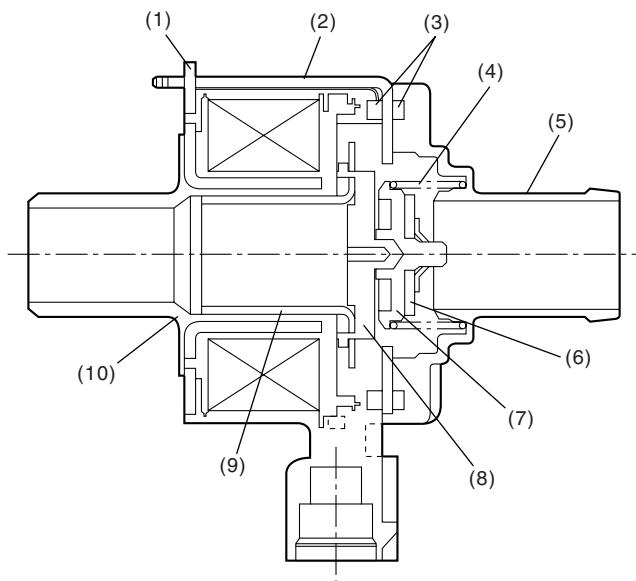
## BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01730

(1)	Magnetic plate	(6)	Valve
(2)	Yoke	(7)	Plate
(3)	Packing	(8)	Retainer
(4)	Spring	(9)	Movable core
(5)	Valve seat	(10)	Bobbin

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

- **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

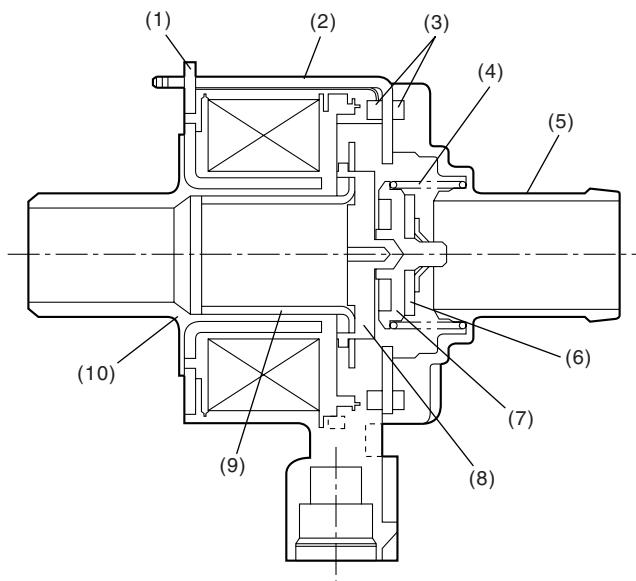
## BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01730

(1)	Magnetic plate	(6)	Valve
(2)	Yoke	(7)	Plate
(3)	Packing	(8)	Retainer
(4)	Spring	(9)	Movable core
(5)	Valve seat	(10)	Bobbin

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

- **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

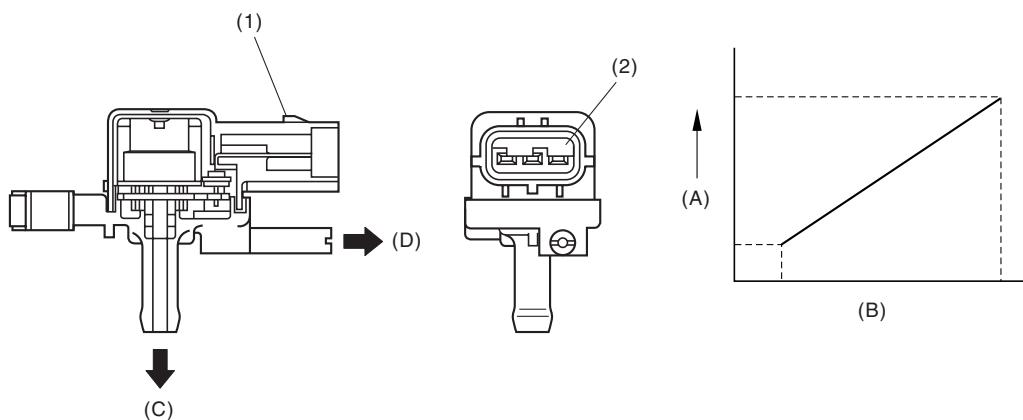
## BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

### 2. COMPONENT DESCRIPTION



EN-01732

(1)	Connector	(A)	Output voltage
(2)	Terminal	(B)	Input voltage
		(C)	To fuel tank
		(D)	To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	$\geq 18 \text{ l}$ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	$< 35^\circ\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Engine speed	$< 6,500 \text{ rpm}$

### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℥ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℥, extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℥.

**Time Needed for Diagnosis:** 1 second × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

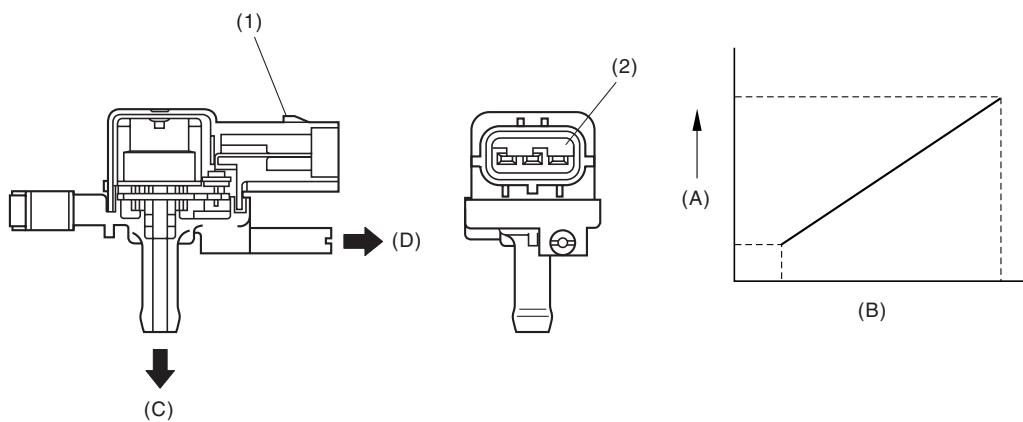
## BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.

Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732

(1)	Connector	(A)	Output voltage
(2)	Terminal	(B)	Input voltage
		(C)	To fuel tank
		(D)	To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

Secondary Parameters	Enable Conditions
Continuous time of completing all condition	$\geq 5$ seconds
Vehicle speed	$\geq 2$ km/h (1 MPH)
All conditions of EVAP canister purge	Possible
Learning value of EVAP conc. during purge	$\leq 0.08$
Feedback lambda coefficient	$\geq 0.9$
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -7.45 kPa (-55.85 mmHg, -2.20 inHg)
Feedback lambda coefficient	≥ 0.9

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -7.33 kPa (-55 mmHg, -2.17 inHg)
Feedback lambda coefficient	≥ 0.9

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

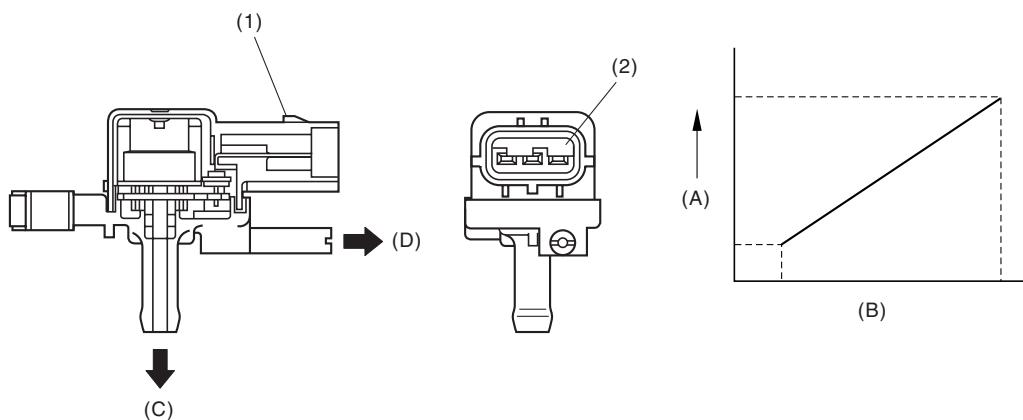
Memorize the freeze frame data. (For test mode \$02)

## BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732

(1)	Connector	(A)	Output voltage
(2)	Terminal	(B)	Input voltage
		(C)	To fuel tank
		(D)	To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	$\geq 5$ seconds
Vehicle speed	$\geq 2$ km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	$\leq 0.08$
Main feedback compensation coefficient	$\geq 0.9$
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.33 kPa (55 mmHg, 2.17 inHg)

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

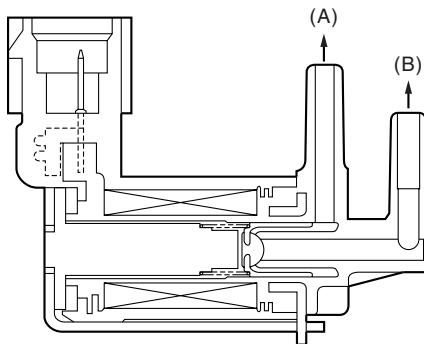
## BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

- (A) To canister
- (B) To intake manifold

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	$\geq 2.5$ seconds
Duty ratio of 'ON'	$< 75\%$
Terminal output voltage	Low

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

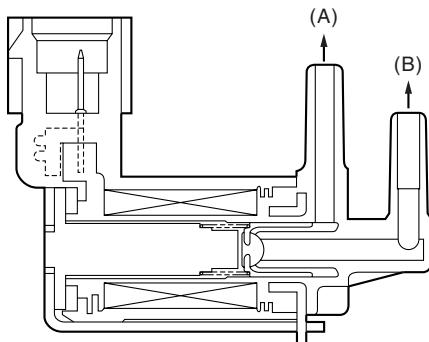
## BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

- (A) To canister
- (B) To intake manifold

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	$\geq 2.5$ seconds
Duty ratio of 'ON'	$\geq 25\%$
Terminal output voltage	High

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

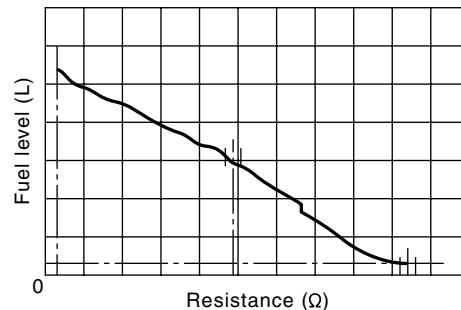
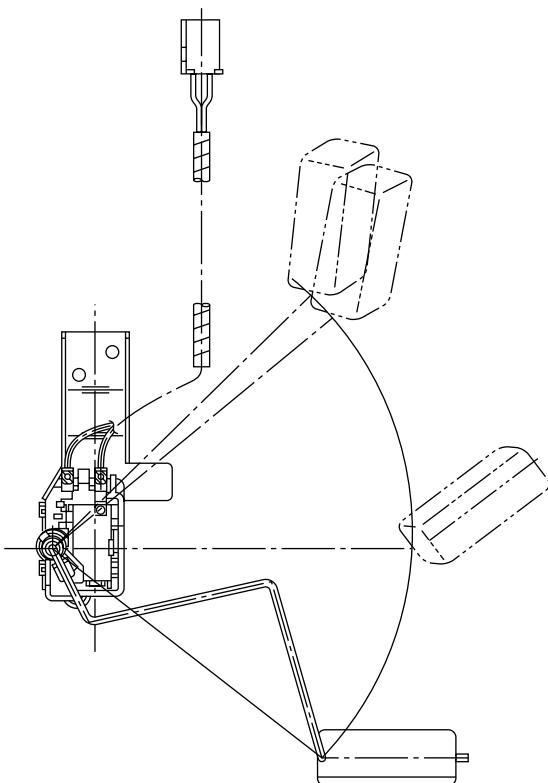
## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

**2. COMPONENT DESCRIPTION**

EN-01734

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℥ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm
After engine start	More than 5 seconds

**Time Needed for Diagnosis:** To be determined.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	$> 331 \text{ kg (729.7 lb)}$
Max. – Min. fuel level output	$\geq 2.6 \text{ l (0.69 US gal, 0.57 Imp gal)}$
Battery voltage	$\geq 10.9 \text{ V}$
Engine speed	$< 6,500 \text{ rpm}$
After engine start	More than 5 seconds

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

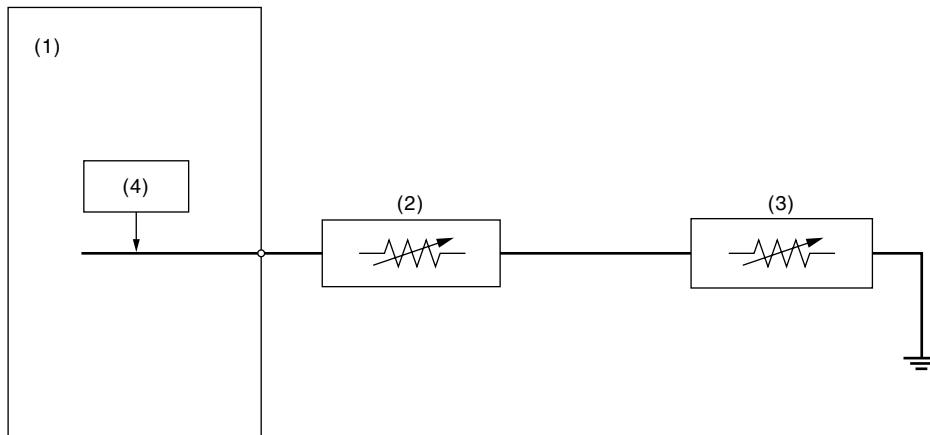
None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

**2. COMPONENT DESCRIPTION**

EN-01735

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

**Judgment Value**

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$< 0.015$ V

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$\geq 0.015$ V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

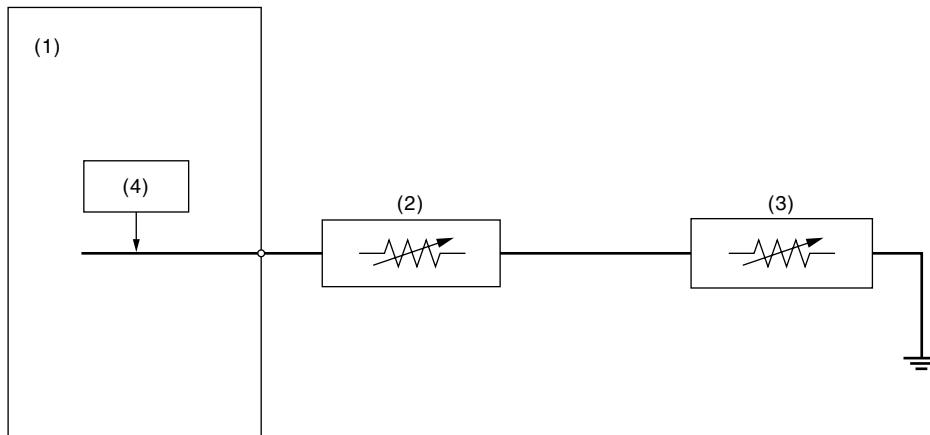
None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

**2. COMPONENT DESCRIPTION**

EN-01735

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

**Judgment Value**

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$\geq 4.958$ V

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	3 seconds or more
Output voltage	$< 4.958$ V

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ←→ 51 ℥ (2.4 ←→ 13.4 US gal, 1.98 ←→ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

#### 3. GENERAL DRIVING CYCLE

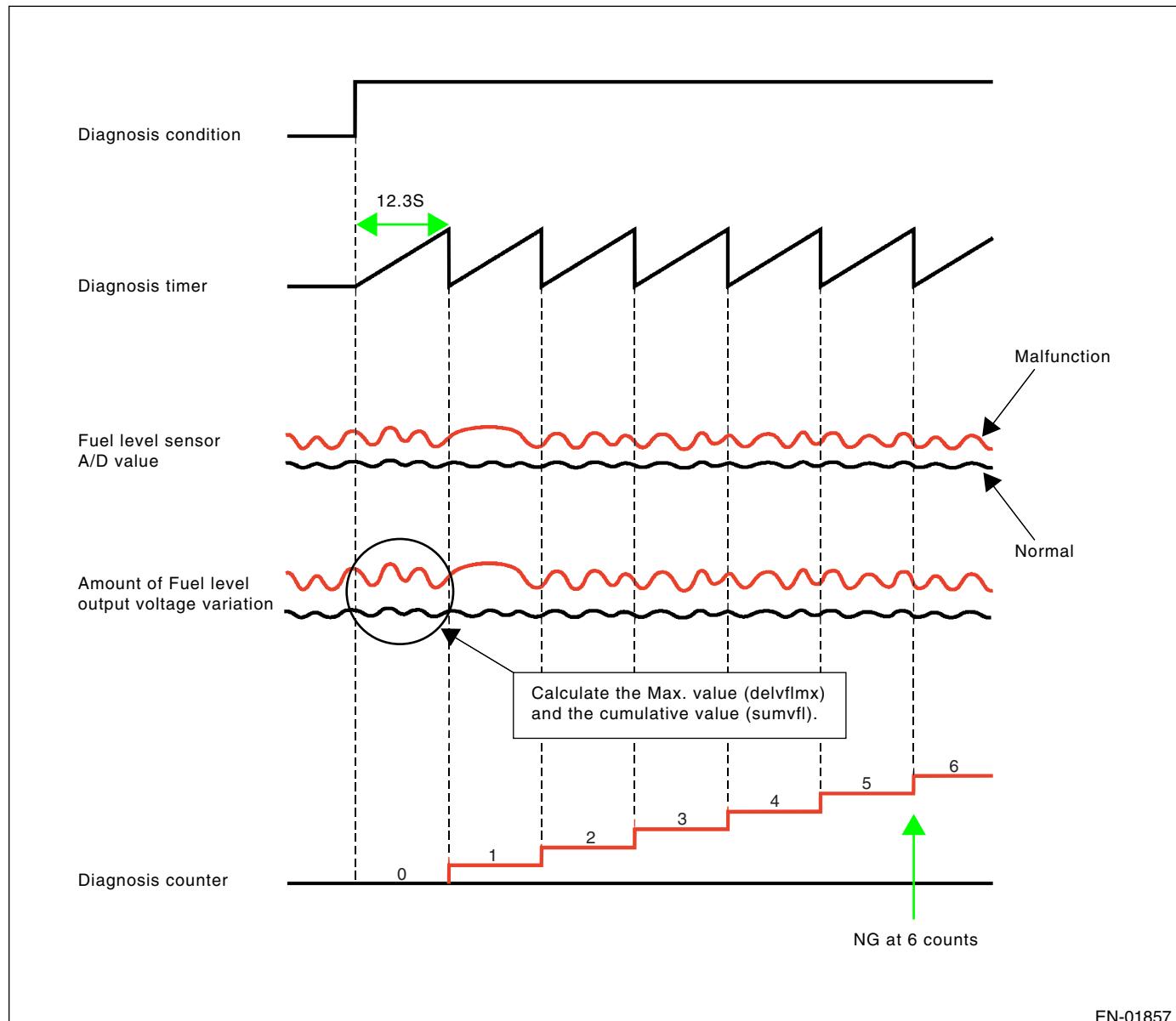
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.3 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



EN-01857

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, $DEFLMAX \geq 0.2 V$ or $SUMFL \geq 15 V$ where, $DEFLMAX$ is Max. deviation of sensor output during 12.3 seconds. $SUMFL$ is integrated value of sensor output deviation during 12.3 seconds.	$\geq 4$ times

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

Max – Min of tank pressure during 12.3 seconds	$\geq 0.05 \text{ kPa (0.375 mmHg, 0.02 inHg)}$
Max – Min of battery voltage during 12.3 seconds	$\geq 0.4 \text{ V}$

**Time Needed for Diagnosis:** 12.3 seconds  $\times$  4 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
DEFLMAX	$< 0.2 \text{ V}$
SUMFL	$< 15 \text{ V}$
Where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds. SUMFL is integrated value of sensor output deviation during 12.3 seconds.	

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BO:DTC P0483 COOLING FAN RATIONALITY CHECK

#### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

#### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 10.9 V

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

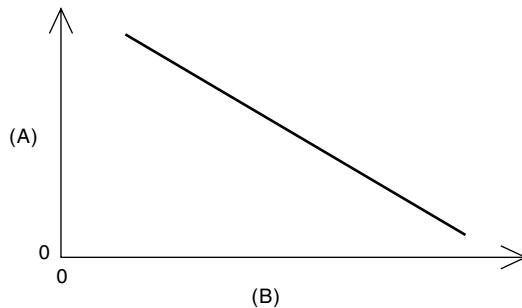
#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 96°C (204.8°F)
Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	< 15 mV (Approx. 1°C (1.8°F))



EN-01737

(A) Engine coolant temperature °C (°F)

(B) A/D value (V)

**Time Needed for Diagnosis:** 5 minutes

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge OK and clear NG when the malfunction criteria below are completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	≥ 15 mV (Approx. 1°C (1.8°F))

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge NG when actual engine speed is not close to target engine speed during idling.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Battery voltage	$\geq 10.9$ V
Atmospheric pressure	$> 75.1$ kPa (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9$ ℥ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda	$0.90 \leftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	$> 5$ seconds
After neutral switch ON-OFF event	$> 5$ seconds
Vehicle speed	0 km/h (0 MPH)

#### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds  $\times$  3 times).

##### Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$< -100$ rpm
Feedback correction for idle air control solenoid valve	Max.

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

##### Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$\geq -100$ rpm

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

## BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )
Battery voltage	$\geq 10.9$ V
Atmospheric pressure	$> 75.1$ kPa (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9$ l (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda	$0.90 \longleftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	$> 5$ seconds
After neutral switch ON-OFF event	$> 5$ seconds
Vehicle speed	0 km/h (0 MPH)

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds  $\times$  3 times).

#### Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$\geq 200$ rpm
Feedback correction for idle air control solenoid valve	Min.

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$< 200$ rpm

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BT:DTC P0512 STARTER REQUEST CIRCUIT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

Judge OFF NG when the engine starts without starter experience.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter SW	ON
Battery voltage	> 8 V

**Time Needed for Diagnosis:** 180 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### BU:DTC P0513 INCORRECT IMMOBILIZER KEY

#### 1. OUTLINE OF DIAGNOSIS

DTC	ITEM	OUTLINE OF DIAGNOSIS
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of key not registered in body integrated unit)
P1570	Antenna	Improper antenna
P1571	Reference Code Incompatibility	Unmatched reference code between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication malfunction between body integrated unit and ECM
P1574	Key Communication Failure	Malfunction of body integrated unit that check the key (transponder) ID or abnormality of transponder.
P1576	EGI Control Module EEPROM	Abnormality of ECM
P1577	IMM Control Module EEPROM	Malfunction of body integrated unit.
P1578	Meter Failure	Unmatched reference code between body integrated unit and combination meter.

#### 2. ENABLE CONDITION

When the engine starting

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis only once engine starting.

#### 4. DIAGNOSTIC METHOD

Judge NG, when the outline of diagnosis consists.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BV:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Feedback in ISC	In operation
Vehicle speed	$< 4$ km/h (2.49 MPH)
After engine starting	1 seconds or more

#### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment 1

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$\geq 1,000$ rpm
Feedback value for ISC	$\leq 0$
Engine speed change every 180 degree engine rev.	$\geq -5$ rpm

##### • Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$\geq 1,000$ rpm
Feedback value for ISC	$\leq 0$

**Time Needed for Diagnosis:** 2 seconds or 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

##### Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$< 200$ rpm

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

#### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.

At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### **BX:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR**

#### **1. OUTLINE OF DIAGNOSIS**

Judge NG when SUM value of ROM is out of the standard value.

#### **2. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Ignition switch	ON

#### **3. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

#### **4. DIAGNOSTIC METHOD**

##### **• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### **Judgment Value**

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### **5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only at engine stop)

#### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### **7. FAIL SAFE**

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

#### **8. ECM OPERATION AT DTC SETTING**

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

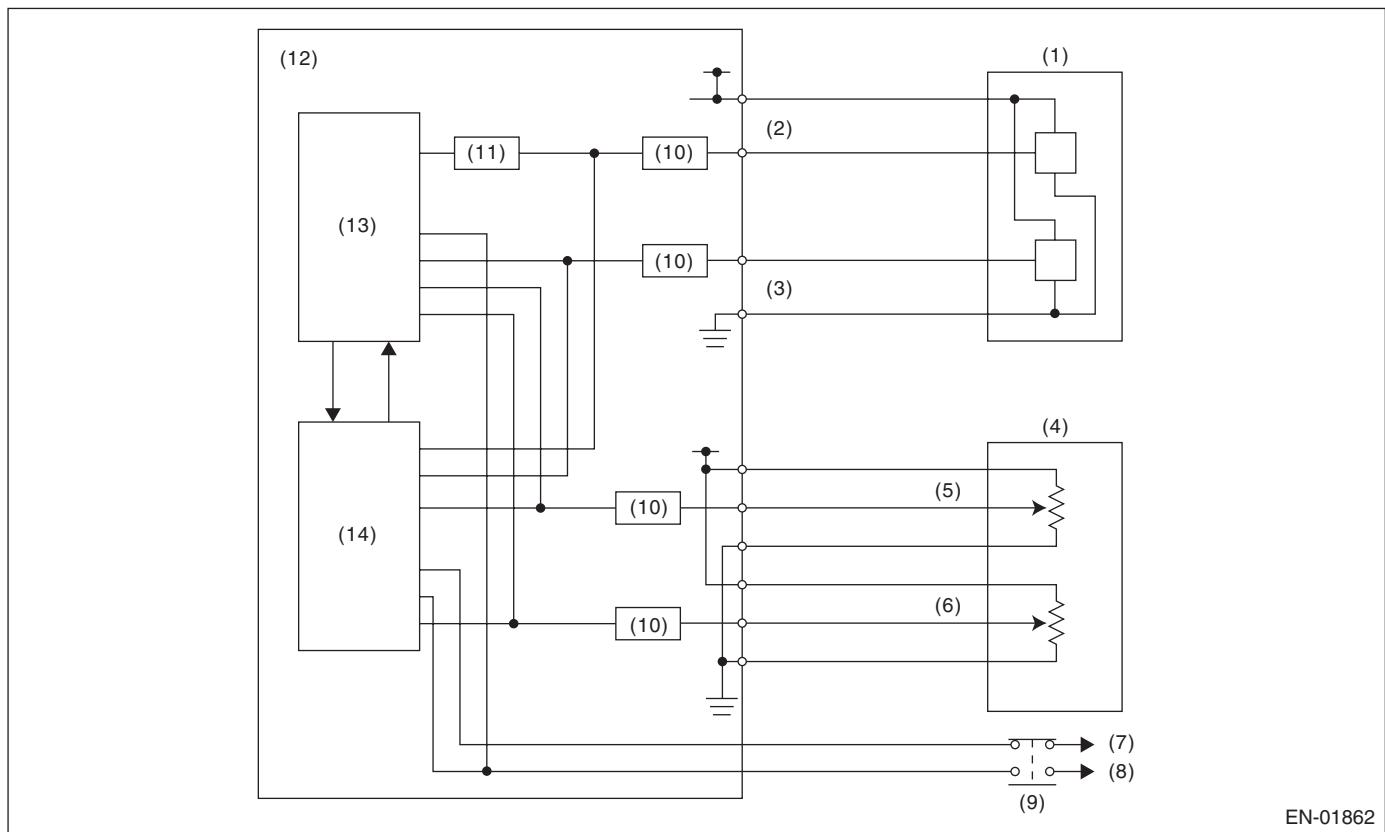
## BY:DTC P0607 CONTROL MODULE PERFORMANCE

## 1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

## 2. COMPONENT DESCRIPTION



EN-01862

(1)	Throttle position sensor	(8)	Stop light
(2)	Throttle position sensor 1	(9)	Brake switch
(3)	Throttle position sensor 2	(10)	I/F circuit
(4)	Accelerator pedal position sensor	(11)	Amplifier circuit
(5)	Accelerator pedal position sensor 1	(12)	Engine control module (ECM)
(6)	Accelerator pedal position sensor 2	(13)	Sub CPU
(7)	Battery	(14)	Main CPU

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	—
(6) Brake SW (with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

### 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
- (5): Always perform the diagnosis continuously on idling.
- (6): Perform the diagnosis when the brake pedal is depressed.
- (7): Always perform the diagnosis continuously.
- (8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within $\times 4 \pm 0.6$ V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle direct value	Within the opening angle $+3.4^\circ$ which calculated from accelerator opening angle coefficient.

#### Time Needed for Diagnosis:

- (1) 250 milliseconds
- (2) 250 milliseconds
- (3) 200 milliseconds
- (4) 200 milliseconds
- (5) 24 milliseconds
- (6) 250 milliseconds
- (7) 200 milliseconds
- (8) 250 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

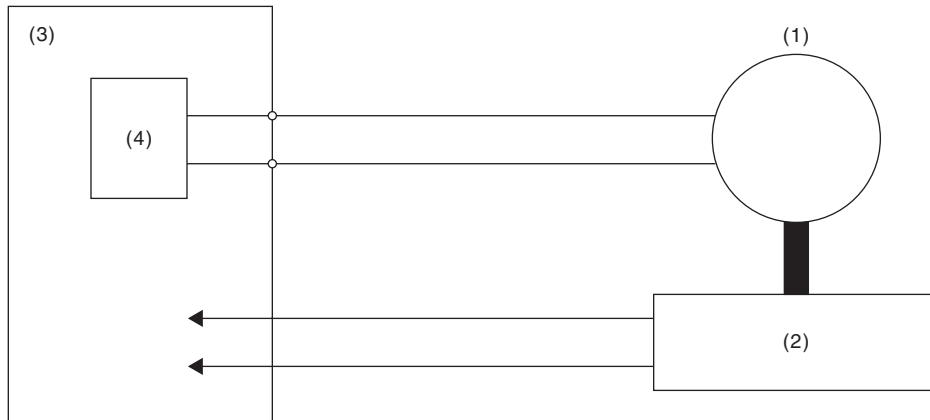
## GENERAL DESCRIPTION

### BZ:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

#### 2. COMPONENT DESCRIPTION



EN-01863

- (1) Motor
- (2) Throttle position sensor
- (3) Engine control module (ECM)
- (4) Drive circuit

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

##### Time Needed for Diagnosis:

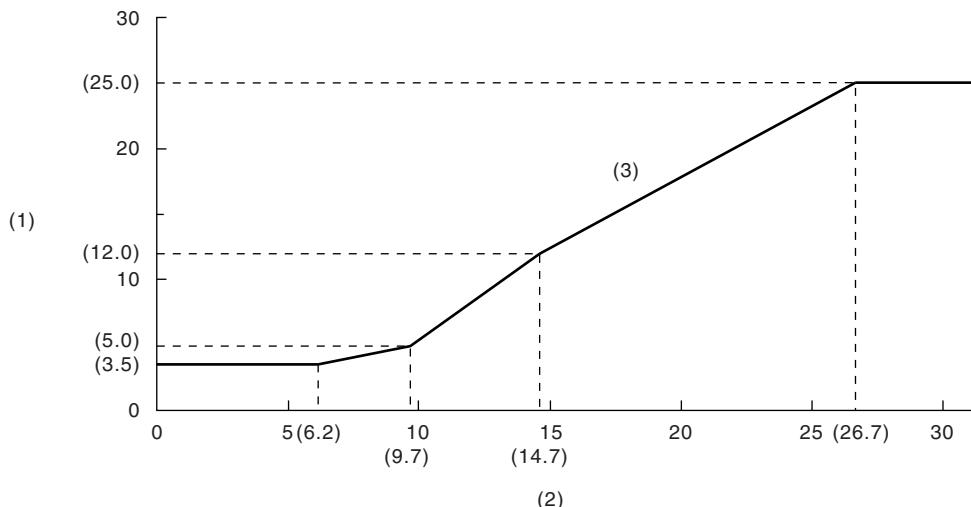
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)

Output duty to drive circuit: 2,000 milliseconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

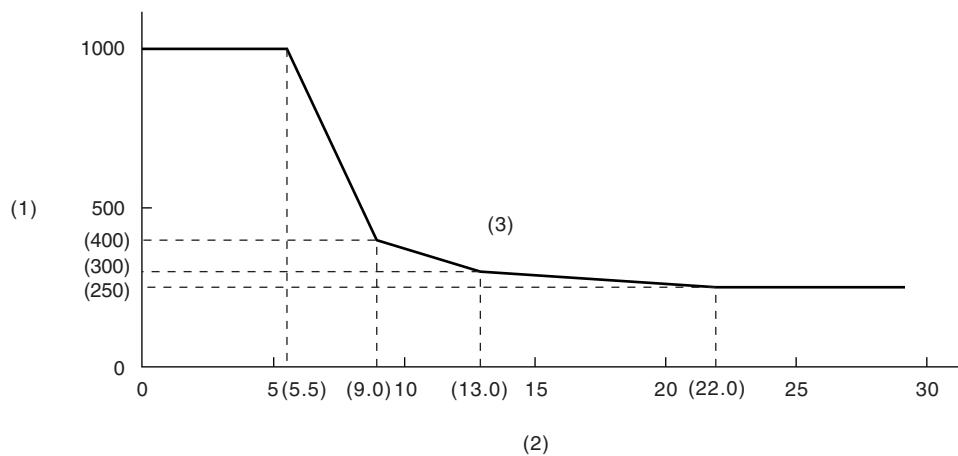
### Details of Judgment



EN-01864

- (1) Difference between target opening angle and actual opening angle (°)
- (2) Target throttle opening angle (°)
- (3) NG area

### Details of Judgment (Always 1,000 milliseconds when the actual opening angle $\leq$ target opening angle)



EN-01865

- (1) Judgment time (milliseconds)
- (2) Throttle position sensor 1 opening angle
- (3) NG area

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

## CA:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CB:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	$\geq 500$ rpm
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
Terminal voltage level when ECM transmits ON signal	High level

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	$\geq 500$ rpm
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
Terminal voltage level when ECM transmits ON signal	Low level

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CC:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	$\geq 500$ rpm

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CD:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	$\geq 500$ rpm

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

##### Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CE:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

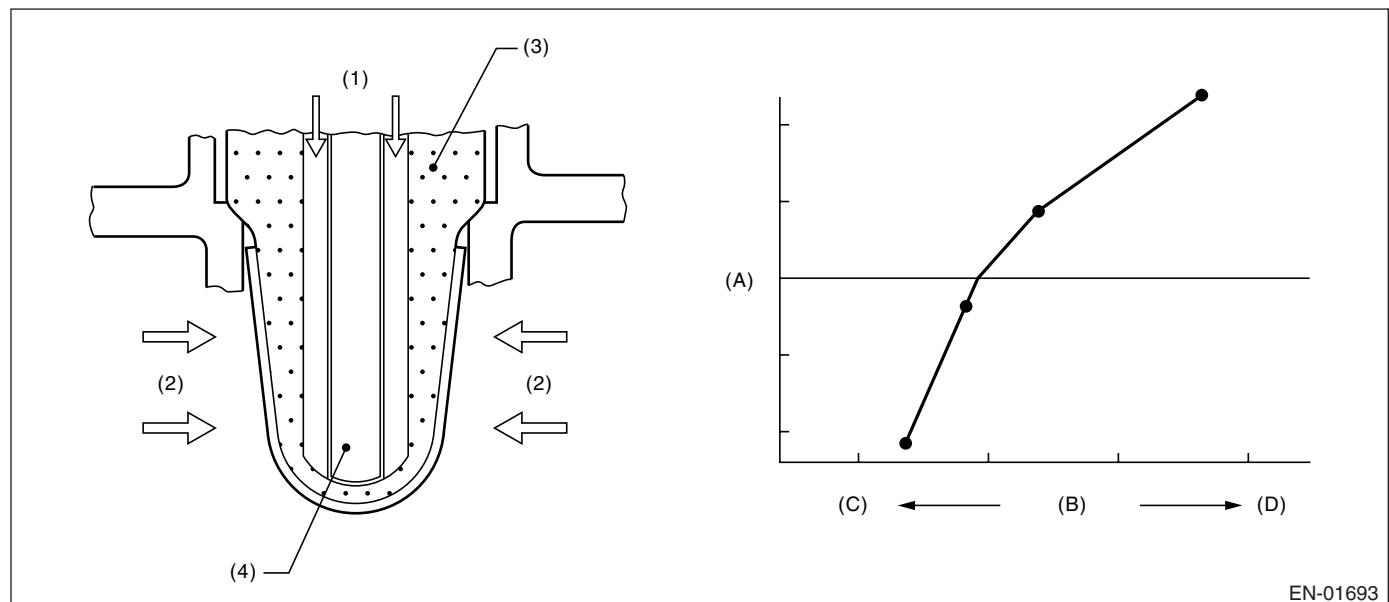
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	$> 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa (563 mmHg, 22.2 inHg)}$
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	$-0.2 \text{ V} \longleftrightarrow 0.1 \text{ V}$
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	$\geq 75^\circ\text{C (167°F)}$
Vehicle speed	$\geq 20 \text{ km/h (12 MPH)}$
Amount of intake air	$\geq 6 \text{ g/s}$
Load change during 0.5 engine rev.	$\leq 0.01 \text{ g/rev}$
Impedance of front oxygen (A/F) sensor	$0 \longleftrightarrow 50 \Omega$
Learning value of evaporation gas density	$\leq 0.2$
Accumulated time of operating canister purge	20 seconds or more

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	$\leq 0.85$

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CF:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

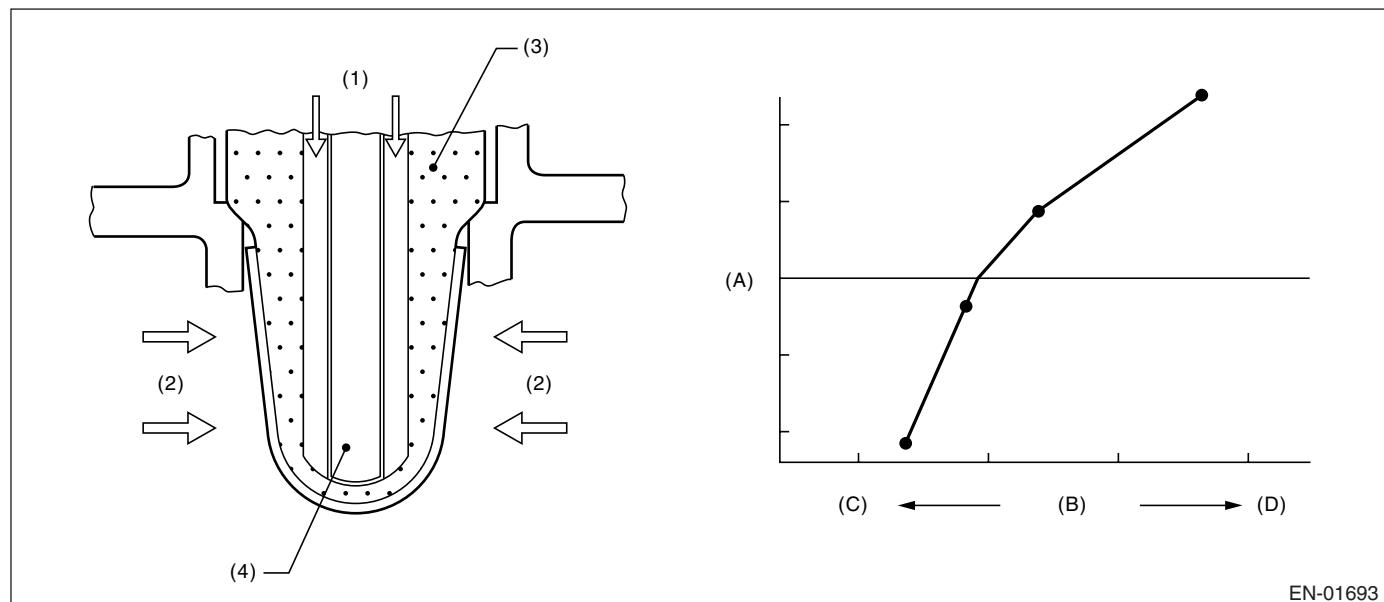
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



EN-01693

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust	(B)	Air fuel ratio
(3)	ZrO <sub>2</sub>	(C)	Lean
(4)	Ceramic heater	(D)	Rich

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	$> 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa (563 mmHg, 22.2 inHg)}$
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	$-0.2 \text{ V} \longleftrightarrow 0.1 \text{ V}$
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	$\geq 75^\circ\text{C (167°F)}$
Vehicle speed	$\geq 20 \text{ km/h (12 MPH)}$
Amount of intake air	$\geq 6 \text{ g/s}$
Load change during 0.5 engine rev.	$\leq 0.01 \text{ g/rev}$
Impedance of front oxygen (A/F) sensor	$0 \longleftrightarrow 50 \Omega$
Learning value of evaporation gas density	$\leq 0.2$
Accumulated time of operating canister purge	20 seconds or more

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O <sub>2</sub> sensor sub feedback compensation coefficient value being at not low limit	$\geq 1.15$

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

# **Diagnostic Trouble Code (DTC) Detecting Criteria**

## **GENERAL DESCRIPTION**

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### **9. ECM OPERATION AT DTC SETTING**

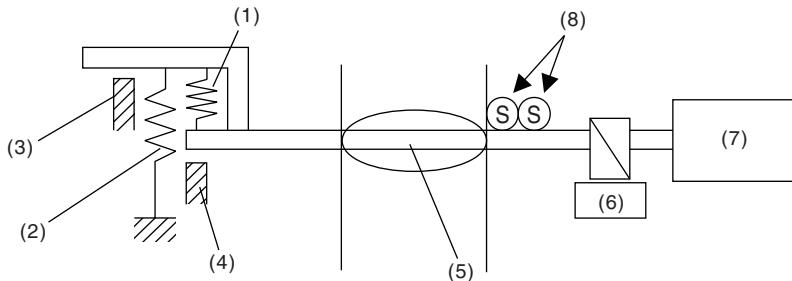
Memorize the freeze frame data. (For test mode \$02)

### CG:DTC P1160 RETURN SPRING FAILURE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

#### 2. COMPONENT DESCRIPTION



EN-01866

(1)	Opener spring	(5)	Throttle valve
(2)	Return spring	(6)	Gear
(3)	Intermediate stopper	(7)	DC motor
(4)	Full closed stopper	(8)	Main and sub throttle sensor

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	$\geq 2^\circ$

**Time Needed for Diagnosis:** 600 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Fix the throttle opening to 6°.

### 9. ECM OPERATION AT DTC SETTING

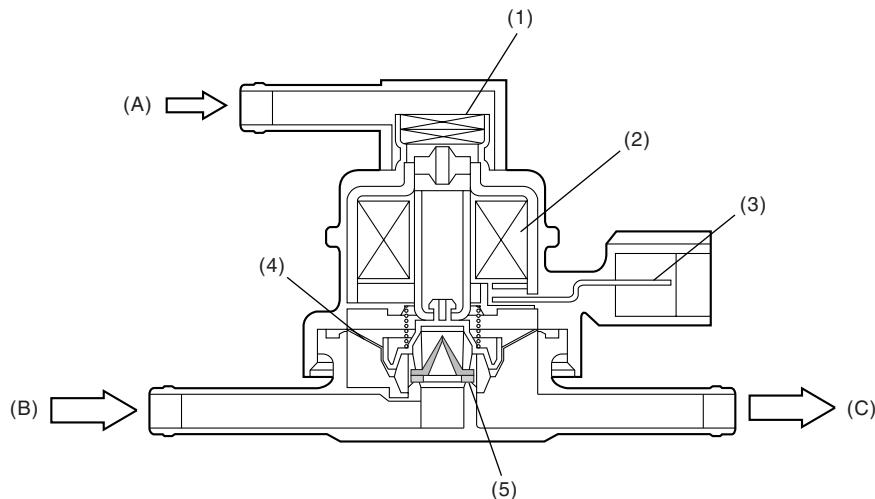
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## CH:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01759

(1)	Filter	(A)	Atmospheric pressure
(2)	Coil	(B)	Shut off valve
(3)	Connector terminal	(C)	To fuel tank
(4)	Diaphragm		
(5)	Valve		

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# **Diagnostic Trouble Code (DTC) Detecting Criteria**

## **GENERAL DESCRIPTION**

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### **6. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### **8. FAIL SAFE**

None

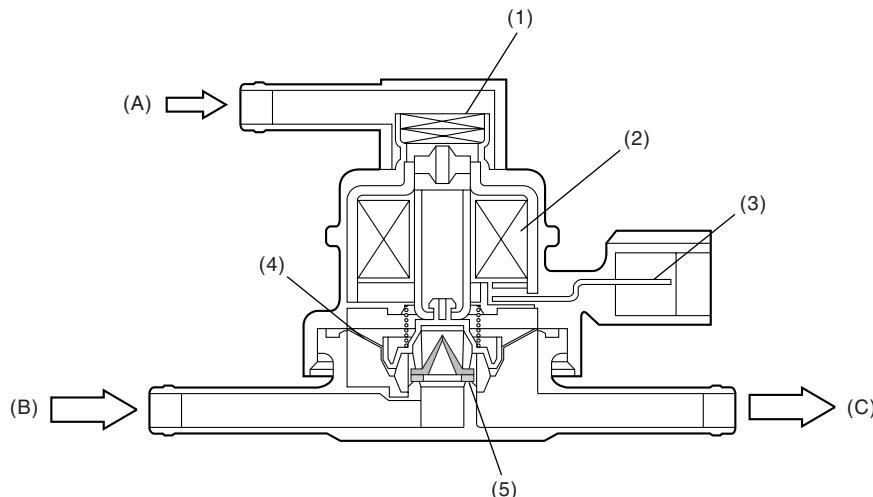
### **9. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

**CI: DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH****1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of pressure control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

**2. COMPONENT DESCRIPTION**

EN-01759

(1)	Filter	(A)	Atmospheric pressure
(2)	Coil	(B)	Shut off valve
(3)	Connector terminal	(C)	To fuel tank
(4)	Diaphragm		
(5)	Valve		

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis after starting the engine.

**5. DIAGNOSTIC METHOD**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

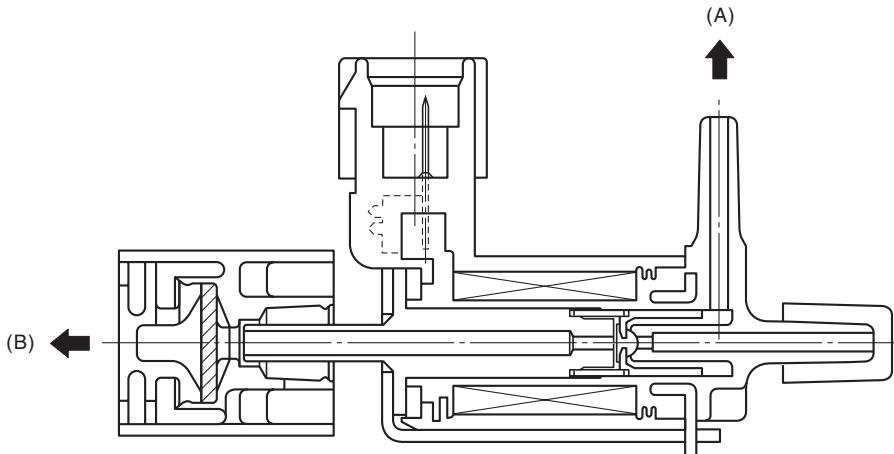
## CJ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CK:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tank pressure switching solenoid.  
 Judge NG when the ECM output level is different from actual terminal level.

**2. COMPONENT DESCRIPTION**

EN-01721

(A) Fuel tank pressure sensor  
 (B) Ambient air

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD**

- **Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

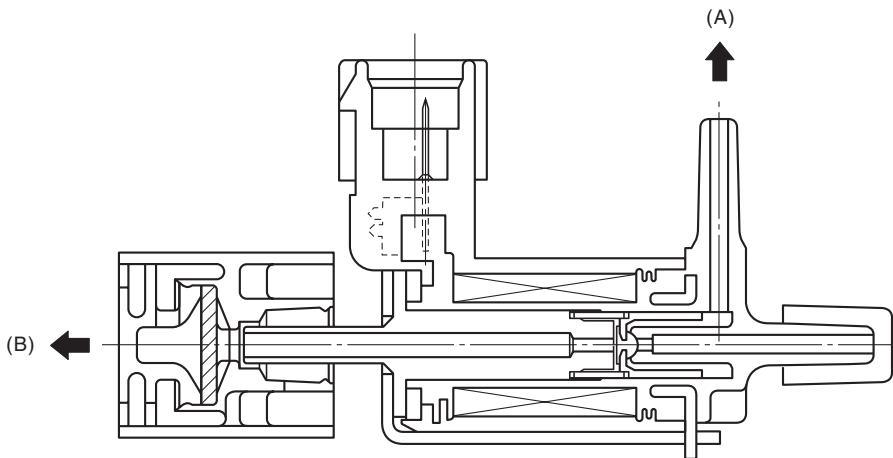
None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**CL:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tank pressure switching solenoid.  
Judge NG when the ECM output level is different from actual terminal level.

**2. COMPONENT DESCRIPTION**

EN-01721

(A) Fuel tank pressure sensor  
 (B) Ambient air

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
None	

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9$ V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CM:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

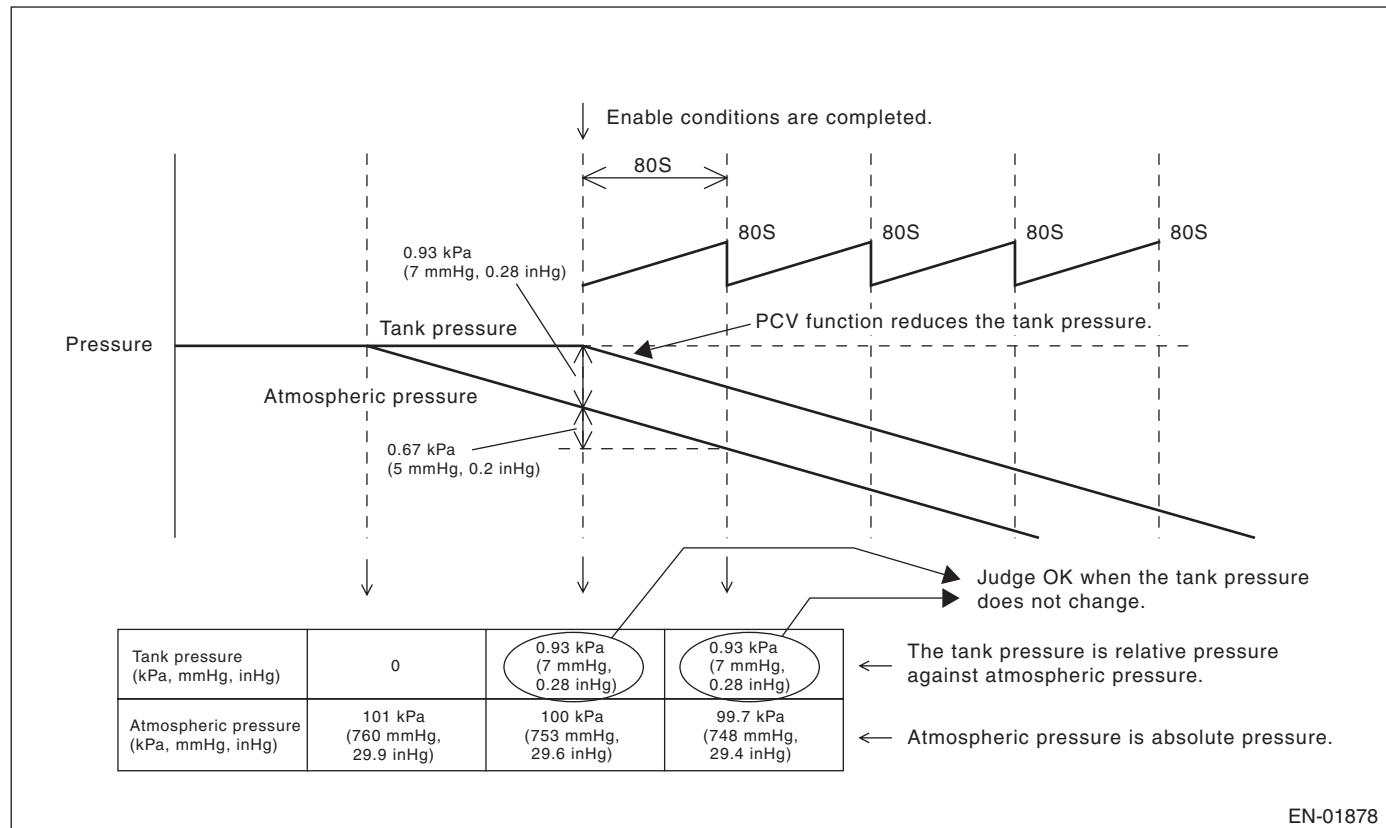
### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.

The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

#### • Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.

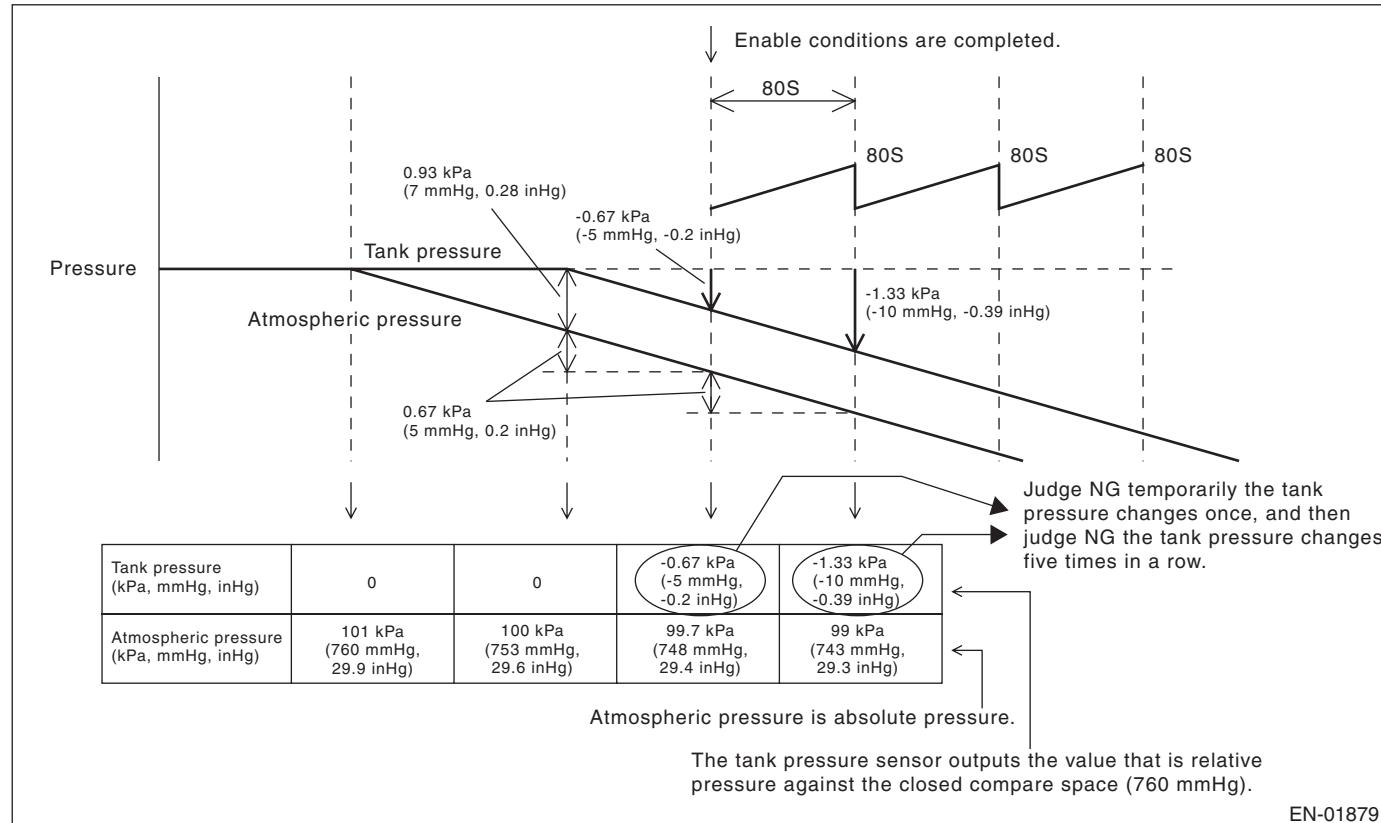


# Diagnostic Trouble Code (DTC) Detecting Criteria

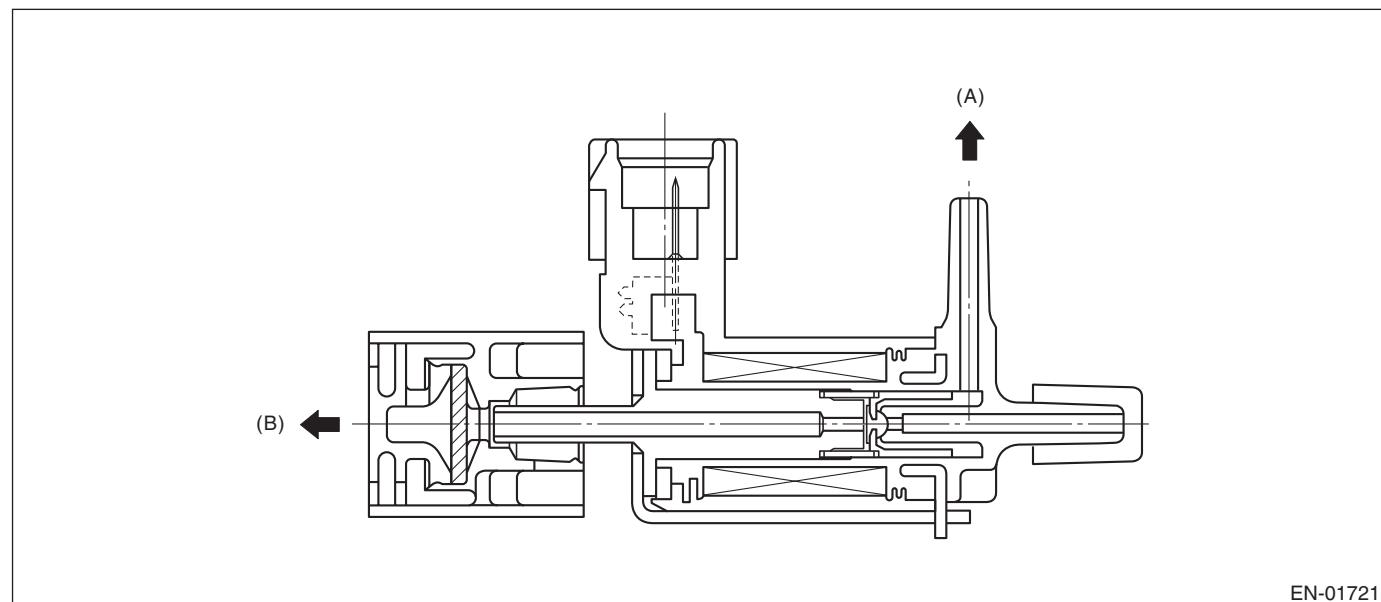
## GENERAL DESCRIPTION

### • Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



## 2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
- (B) Ambient air

### 3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9$ V
Fuel level	$9 \longleftrightarrow 51$ ℥ (2.38 $\longleftrightarrow$ 13.3 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	$< -0.67$ kPa (-5 mmHg, -0.2 inHg) or $> -0.93$ kPa (7 mmHg, 0.28 inHg)

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

#### Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	$\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	$\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	$< 2.25$ ℥ (0.59 US gal, 0.49 Imp gal)

**Time Needed for Diagnosis:** 80 seconds  $\times$  5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	$\geq 0.67$ kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	$< 0.67$ kPa (4.5 mmHg, 0.18 inHg)

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

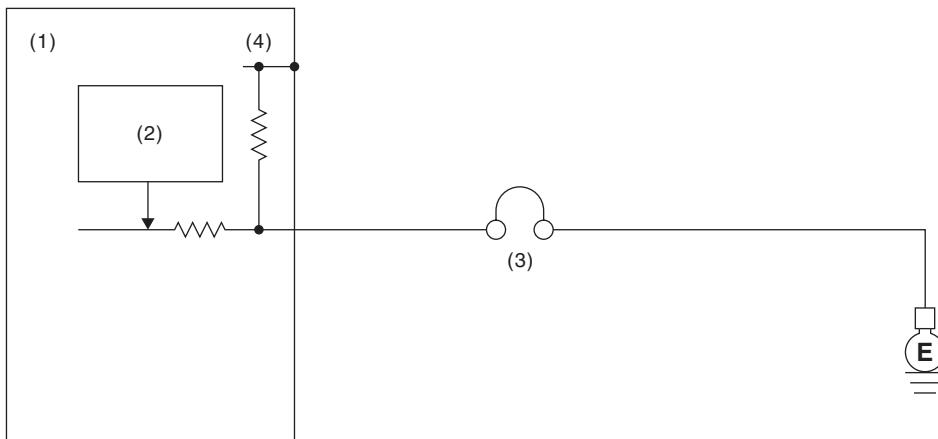
### CN:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

#### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.

Judge NG when the diagnosis terminal voltage is high.

#### 2. COMPONENT DESCRIPTION



EN-01790

- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

#### 3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSIS METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

##### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	High

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	Low

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CO:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OFF NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	
Starter ON	Not experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

##### Time Needed for Diagnosis:

Not determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Diagnosed
Battery voltage	> 8 V

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

### 2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	Low
Battery voltage	$\geq 10.9$ V
Before and after starting the engine	After starting the engine

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	$\geq 10.9$ V
Before and after starting the engine	After starting the engine

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### **CQ:DTC P1570 ANTENNA**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CR:DTC P1571 REFERENCE CODE INCOMPATIBILITY**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CS:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CT:DTC P1574 KEY COMMUNICATION FAILURE**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CU:DTC P1576 EGI CONTROL MODULE EEPROM**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CV:DTC P1577 IMM CONTROL MODULE EEPROM**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CW:DTC P1578 METER FAILURE**

#### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STi)-175, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CX:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)**

### **1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve open driving.

### **2. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )
Ambient temperature	$\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )

### **3. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

### **4. DIAGNOSTIC METHOD**

#### **• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### **Judgment Value**

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve “close” signal output	2.2 seconds or more

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### **• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

#### **Judgment Value**

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve “close” signal output	2.2 seconds or more

### **5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### **7. FAIL SAFE**

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

### **8. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CY:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve “close” signal output	2.2 seconds or more

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve “close” signal output	2.2 seconds or more

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **CZ:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)**

### **1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

### **2. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )

### **3. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

### **4. DIAGNOSTIC METHOD**

#### **• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### **Judgment Value**

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve “open” signal output	1.4 seconds or more

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### **• Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

#### **Judgment Value**

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve “open” signal output	1.4 seconds or more

### **5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### **7. FAIL SAFE**

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

### **8. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DA:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

#### 2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ )

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve “open” signal output	1.4 seconds or more

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve “open” signal output	1.4 seconds or more

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

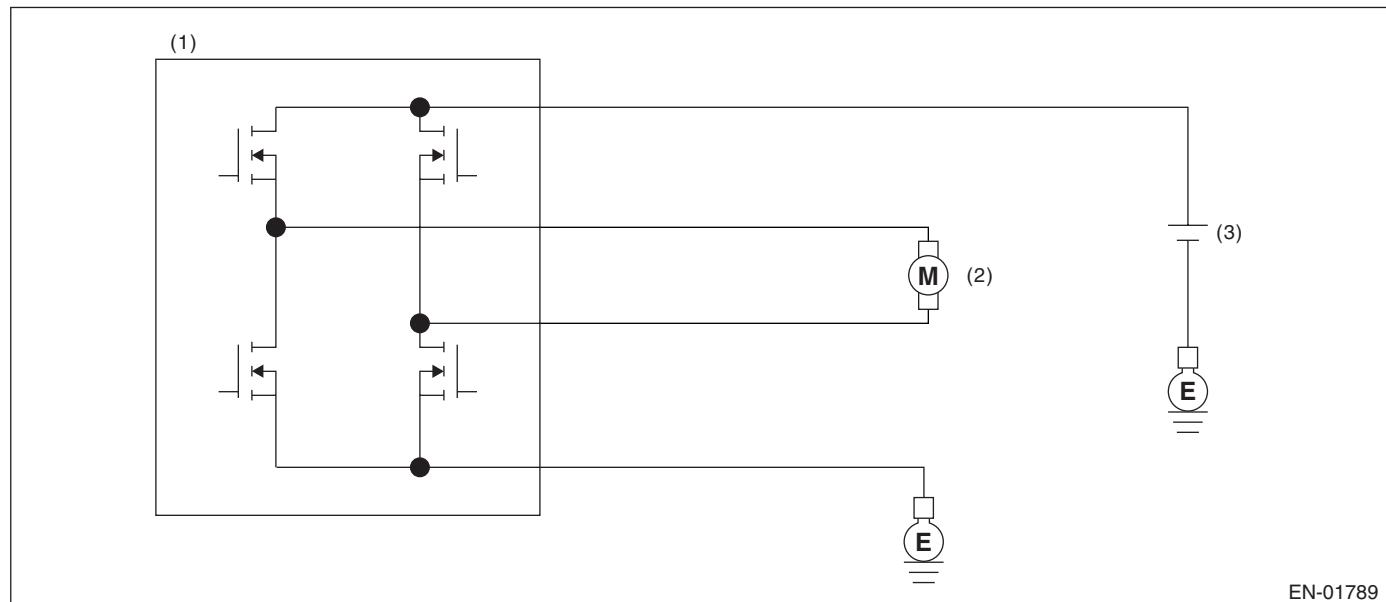
## DB:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

Malfunction Criteria	Threshold Value
Current	$< 5$ mA

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

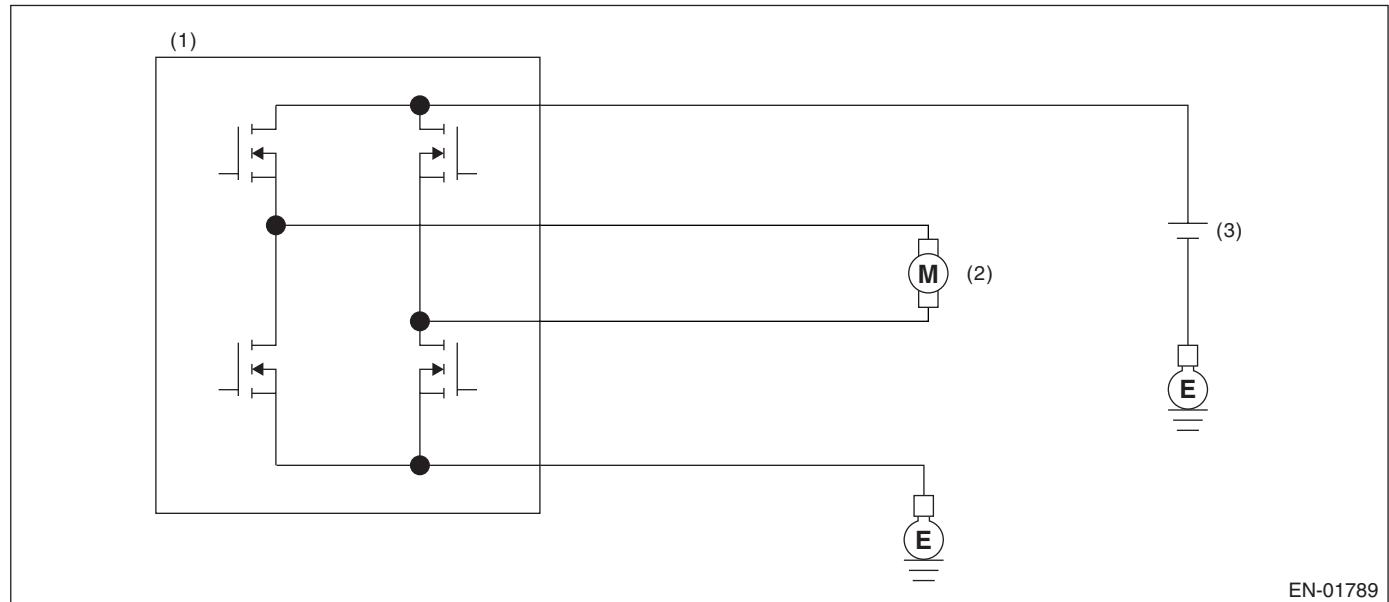
## DC:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

Malfunction Criteria	Threshold Value
Current	$> 3$ A

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

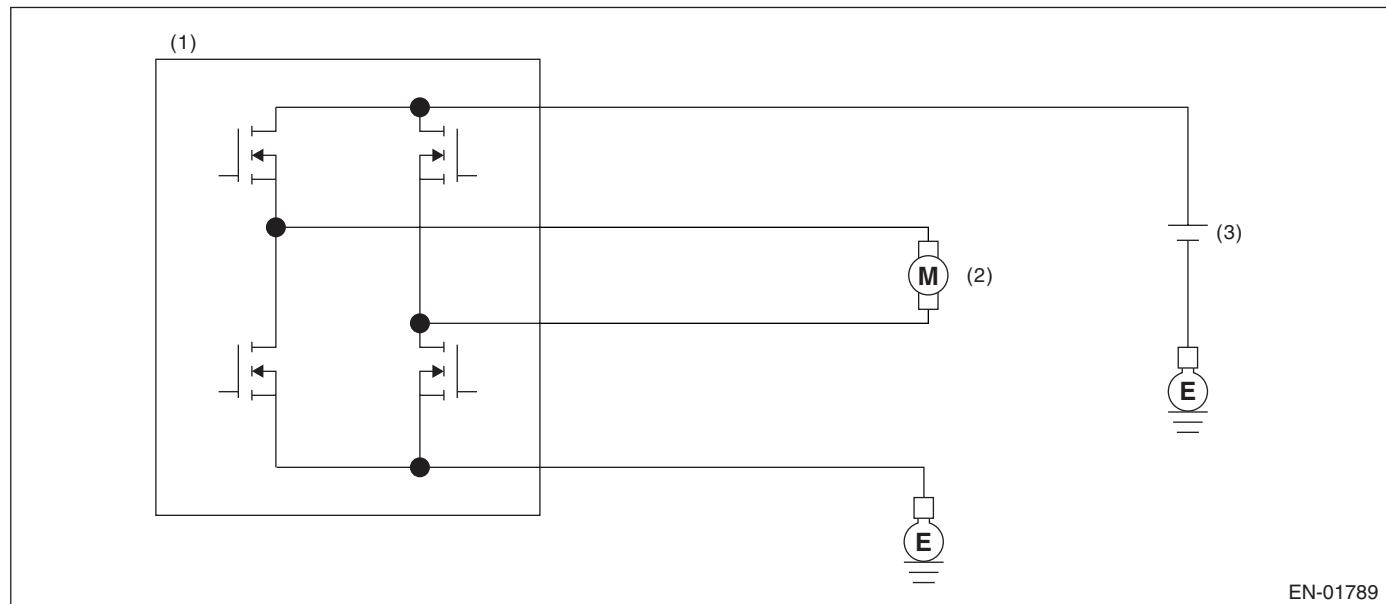
## DD:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

Malfunction Criteria	Threshold Value
Current	$< 5$ mA

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

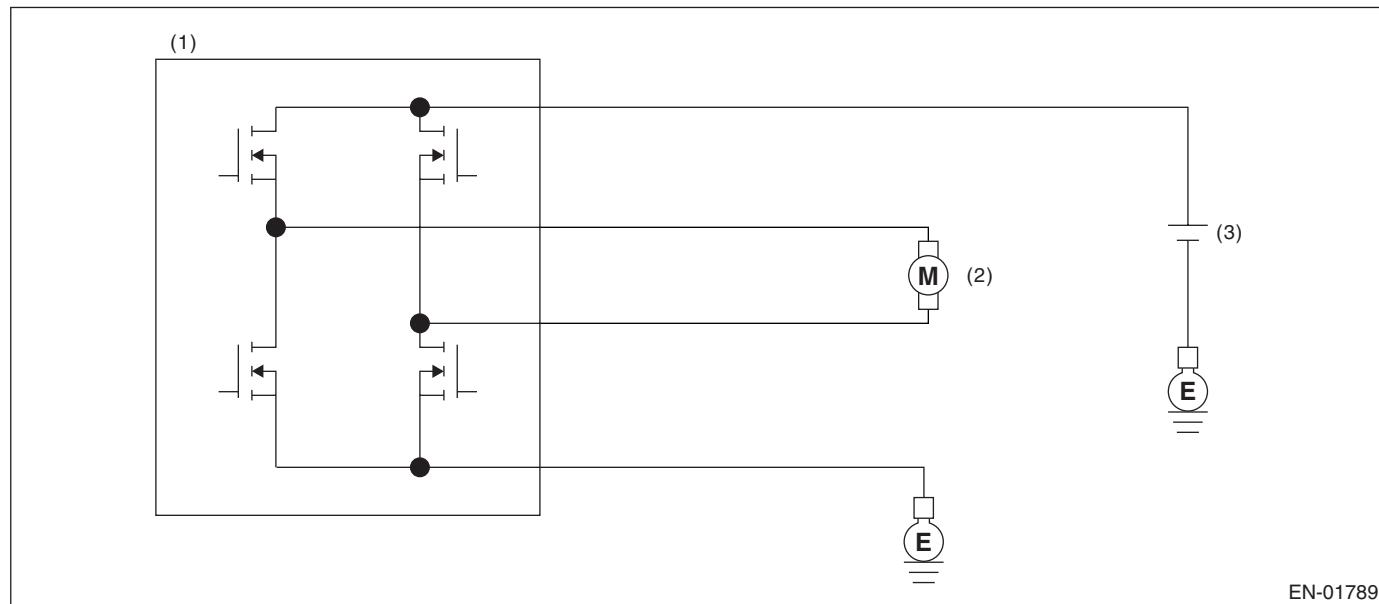
## DE:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9$ V

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row.

Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

Malfunction Criteria	Threshold Value
Current	$> 3$ A

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

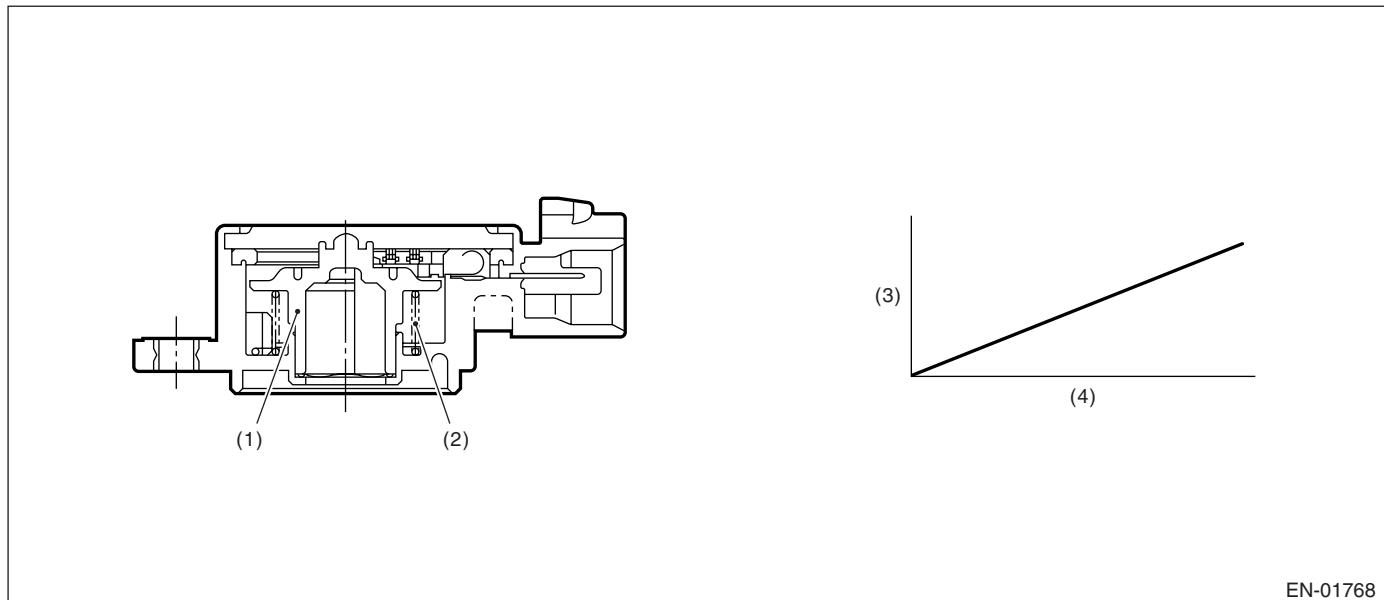
Memorize the freeze frame data. (For test mode \$02)

## DF:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

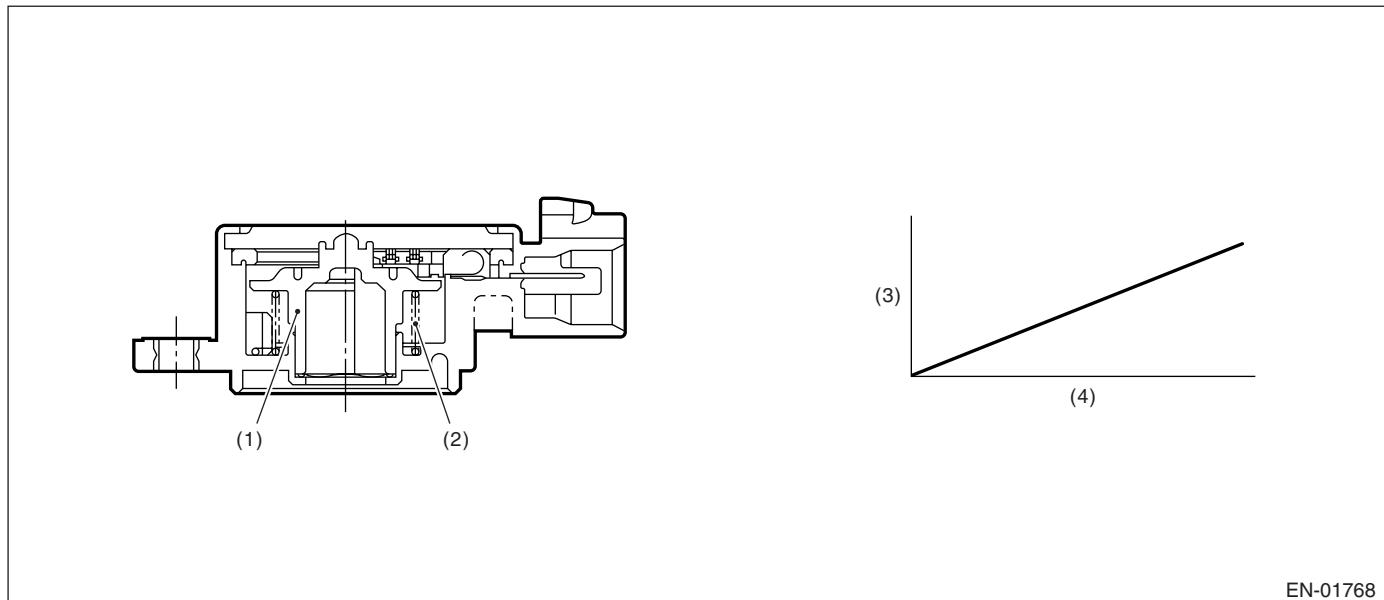
Memorize the freeze frame data. (For test mode \$02)

## DG:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.843$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

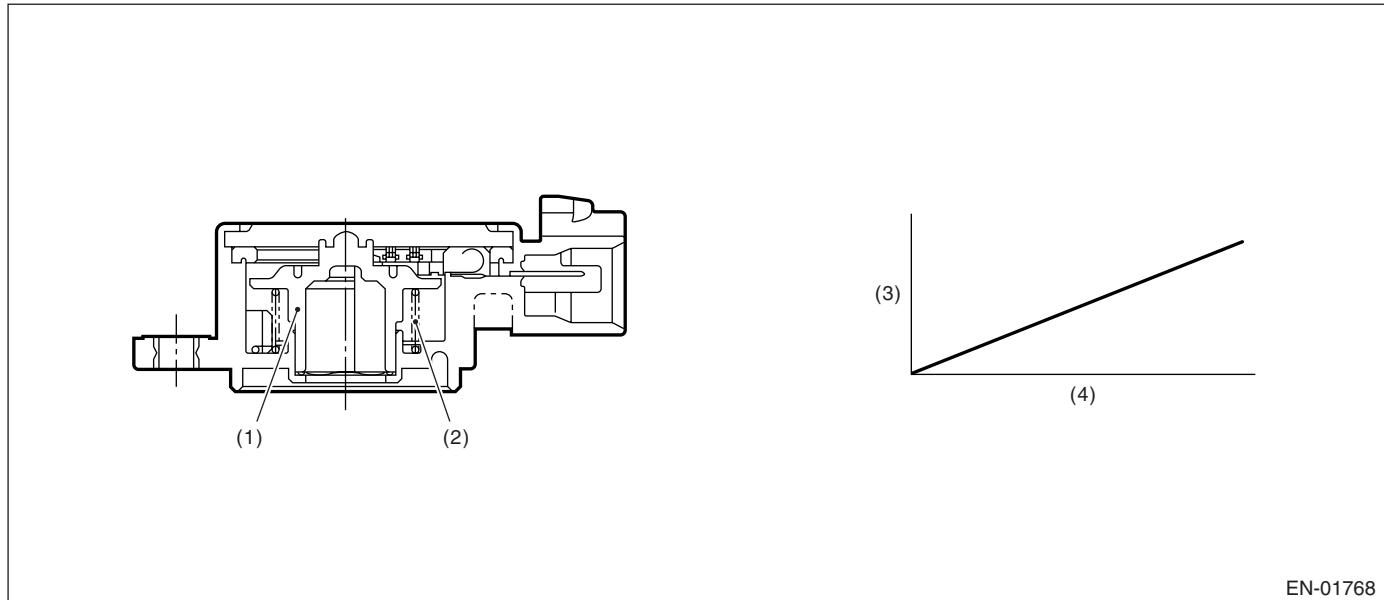
Memorize the freeze frame data. (For test mode \$02)

## DH:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

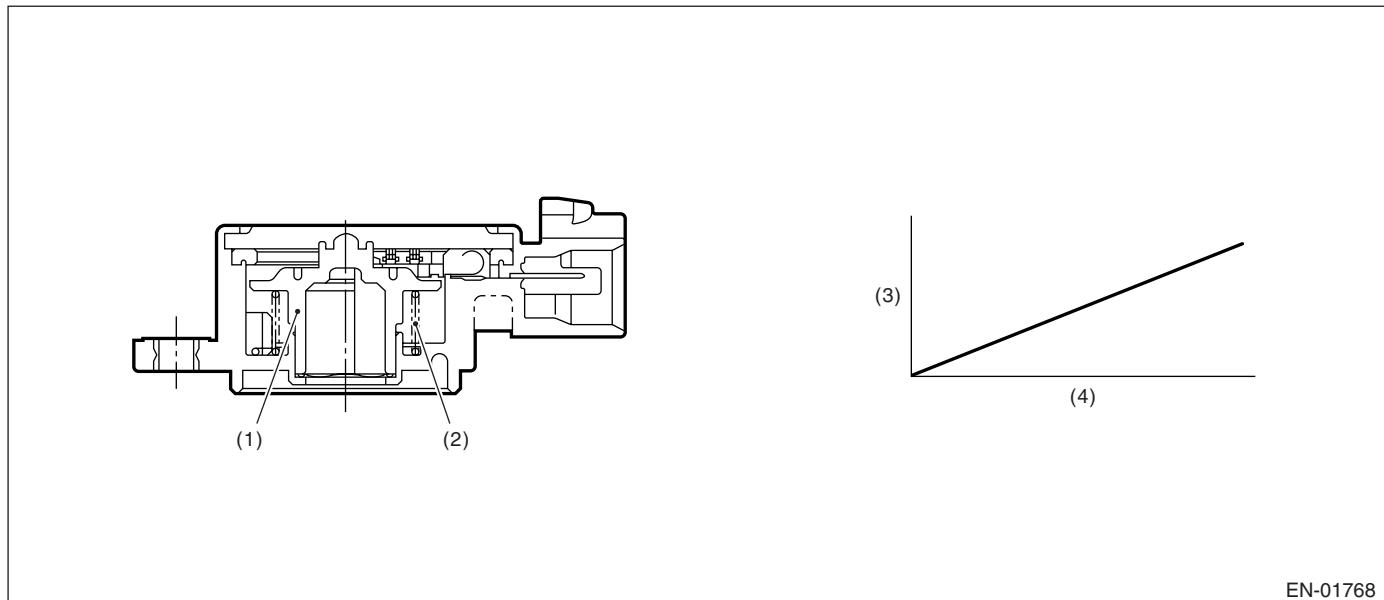
Memorize the freeze frame data. (For test mode \$02)

## DI: DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.843$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### DJ:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$\geq 99.61\%$
OCV control present current	$< 0.306$ A

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	$\geq 0.14\%$
Target current value of OCV – Control current value of OCV	$\geq 0.08$ A

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### **DK:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)**

#### **1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### **2. ENABLE CONDITION**

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9$ V

#### **3. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

#### **4. DIAGNOSTIC METHOD**

##### **• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### **Judgment Value**

Malfunction Criteria	Threshold Value
OCV control duty	$< 0.39\%$
OCV control present current	$< 0.306$ A

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### **• Normality Judgment**

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### **Judgment Value**

Malfunction Criteria	Threshold Value
$  \text{Target current value of OCV} - \text{Control current value of OCV}  $	$\geq 0.08$ A

#### **5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### DL:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$\geq 99.61\%$
OCV control present current	$< 0.306$ A

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	$\geq 0.14\%$
Target current value of OCV – Control current value of OCV	$\geq 0.08$ A

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### DM:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9$ V

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$< 0.39\%$
OCV control present current	$\geq 0.306$ A

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
$  \text{Target current value of OCV} - \text{Control current value of OCV}  $	$< 0.08$ A

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. FAIL SAFE

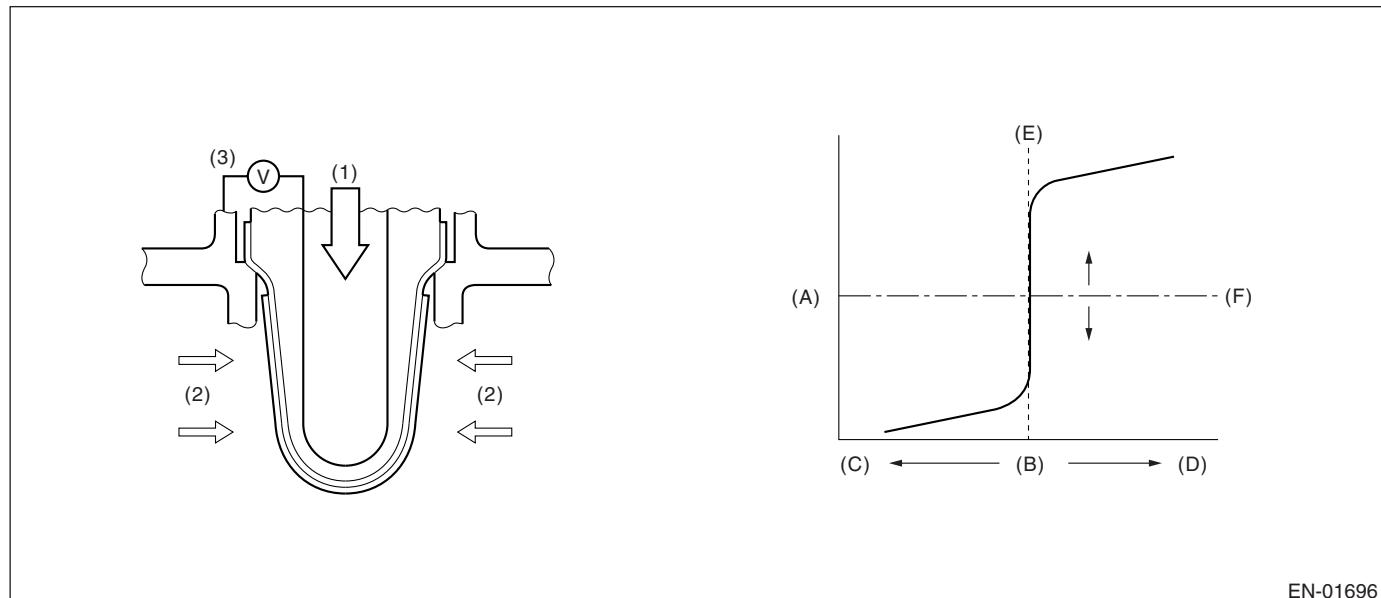
- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DN:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount. If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter). Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

**2. COMPONENT DESCRIPTION**

EN-01696

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust gas	(B)	Air fuel ratio
(3)	Electromotive force	(C)	Rich
		(D)	Lean
		(E)	Theoretical air fuel ratio
		(F)	Comparative voltage

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 40 \text{ degC}$ and $< 105 \text{ degC}$
Accumulative time of closed loop control with secondary oxygen sensor	130 secs.
Closed loop control with secondary oxygen sensor	In operation
Idling SW	Off
Accumulative time of vehicle speed above 75 km/h (rich side only)	55 secs.

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Average of fuel trim parameter based on a secondary oxygen sensor	< -0.03
Count of limits moving to rich	≥ 4 count
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	≥ 1.5

**Time Needed for Diagnosis:** 600 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When “Clear Memory” was performed

### 8. FAIL SAFE

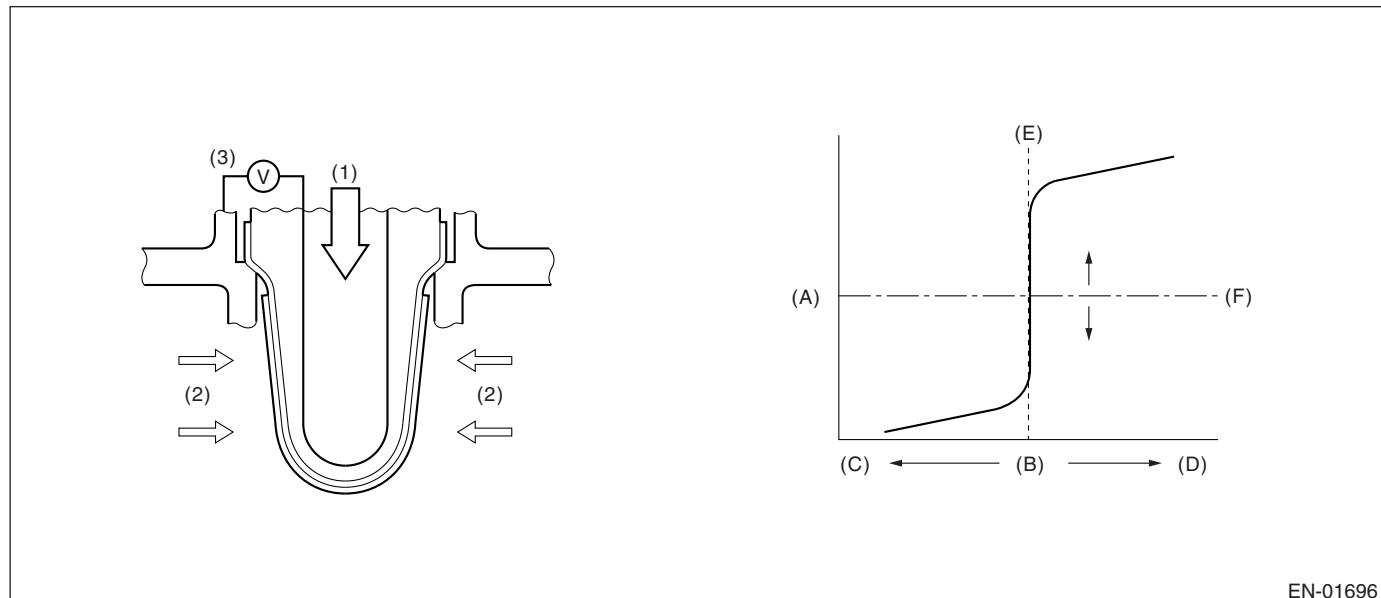
None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DO:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount. If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter). Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

**2. COMPONENT DESCRIPTION**

EN-01696

(1)	Atmosphere	(A)	Electromotive force
(2)	Exhaust gas	(B)	Air fuel ratio
(3)	Electromotive force	(C)	Rich
		(D)	Lean
		(E)	Theoretical air fuel ratio
		(F)	Comparative voltage

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 40 \text{ degC}$ and $< 105 \text{ degC}$
Accumulative time of closed loop control with secondary oxygen sensor	130 secs.
Closed loop control with secondary oxygen sensor	In operation
Idling SW	Off
Accumulative time of vehicle speed above 75 km/h (rich side only)	55 secs.

**4. GENERAL DRIVING CYCLE**

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Average of fuel trim parameter based on a secondary oxygen sensor	$\geq 0.025$
Count of limits moving to lean	$\geq 4$ count
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	$\leq 5.6$

**Time Needed for Diagnosis:** 600 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

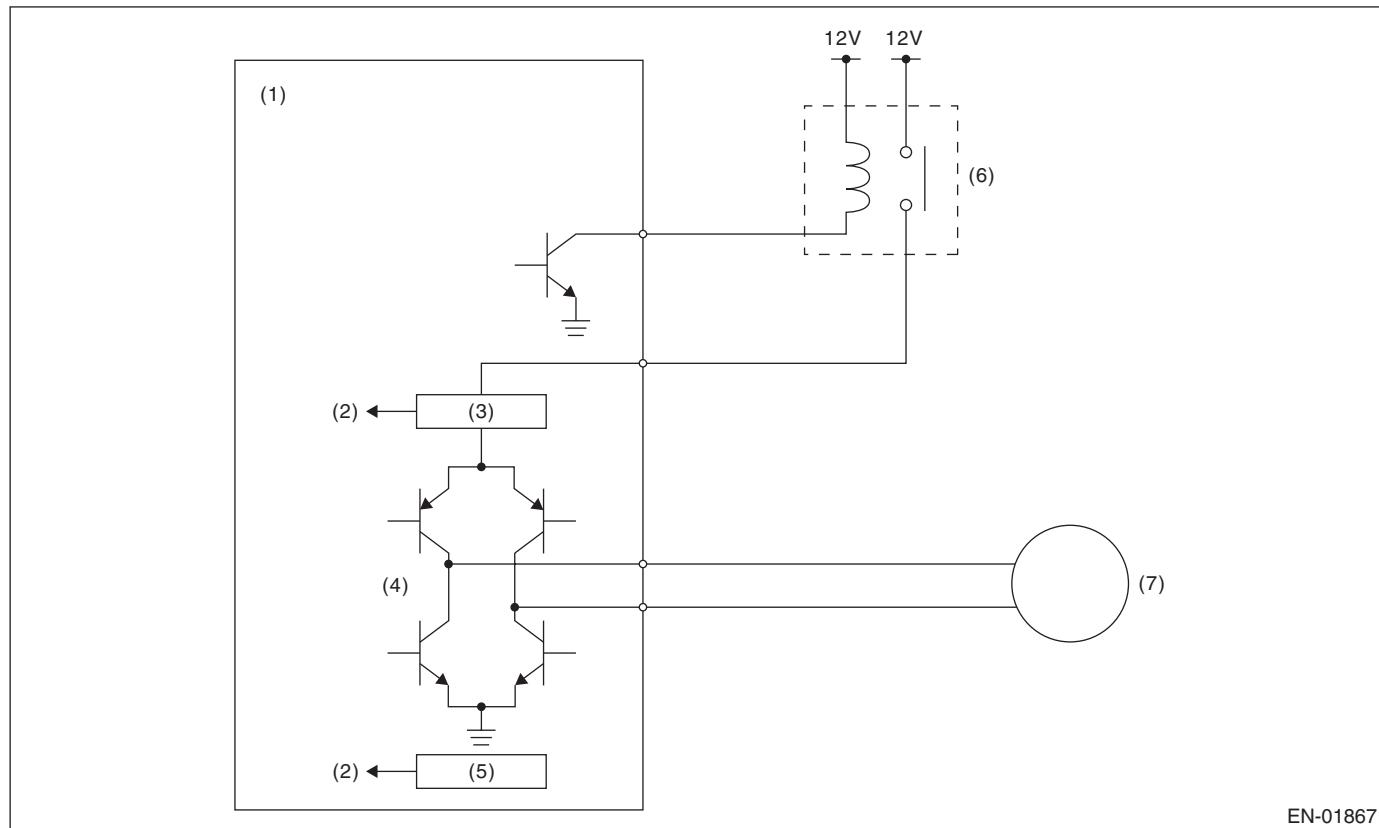
Memorize the freeze frame data. (For test mode \$02)

## DP:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

### 2. COMPONENT DESCRIPTION



(1)	Engine control unit (ECM)	(5)	Temperature detection circuit
(2)	Detection circuit	(6)	Electronic control throttle relay
(3)	Overcurrent detection circuit	(7)	Motor
(4)	Drive circuit		

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8$ A
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ ( $347^{\circ}\text{F}$ )

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

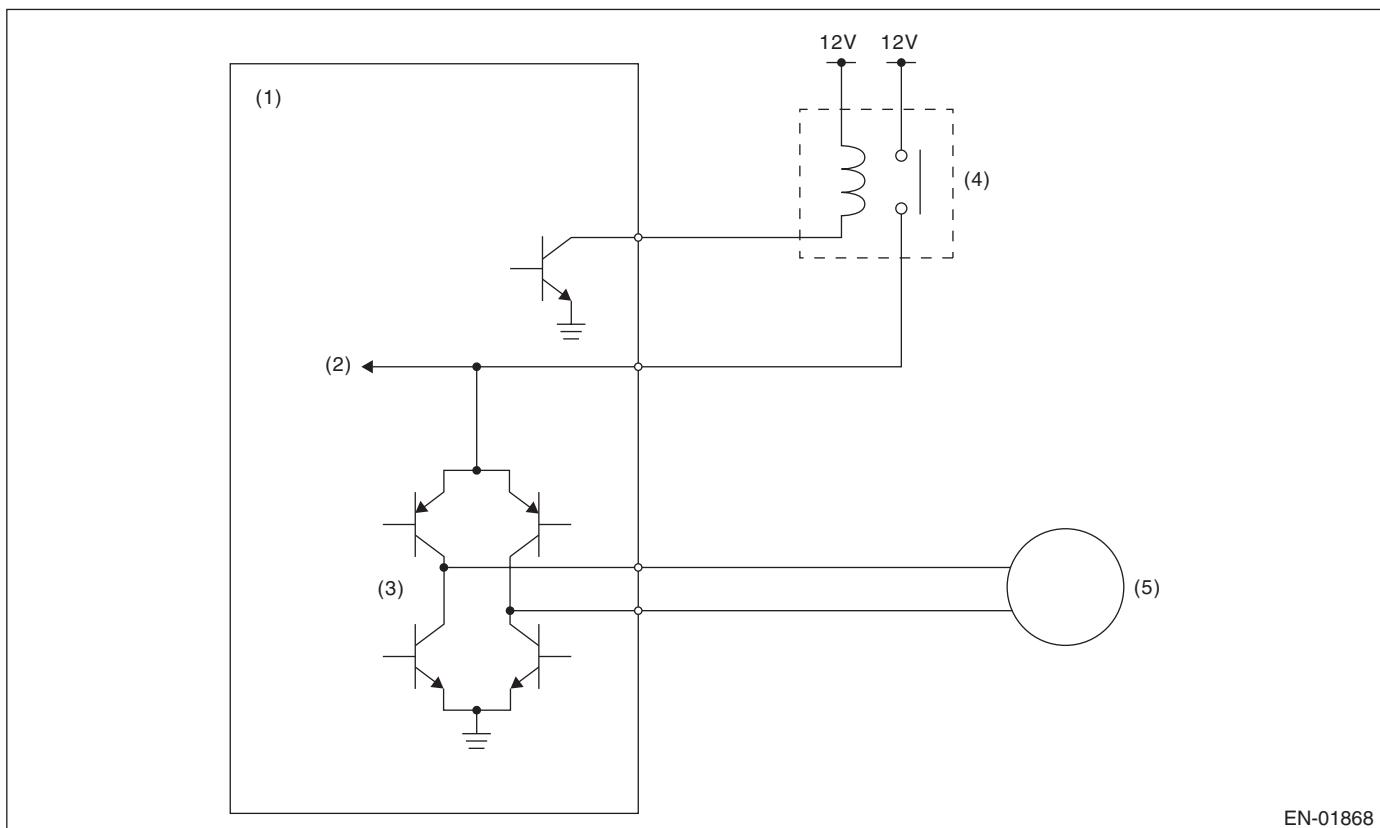
Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

**DQ:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW****1. OUTLINE OF DIAGNOSIS**

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to ON.

**2. COMPONENT DESCRIPTION**

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic control throttle relay
- (5) Motor

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

**4. GENERAL DRIVING CYCLE**

Always perform the diagnosis continuously.

**5. DIAGNOSTIC METHOD****• Abnormality Judgment**

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

**Judgment Value**

Malfunction Criteria	Threshold Value
Motor power voltage	$\geq 5$ V

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

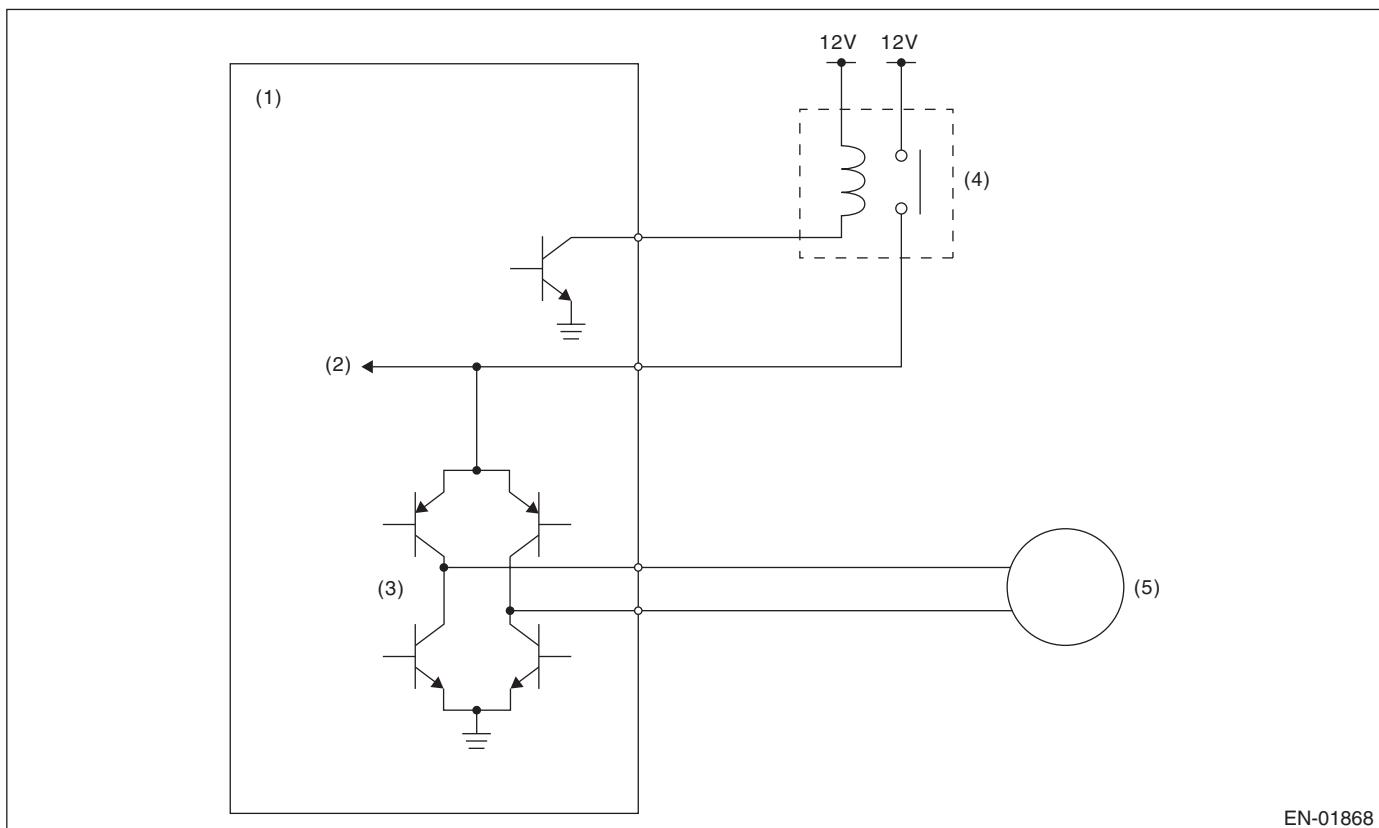
Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

**DR:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH****1. OUTLINE OF DIAGNOSIS**

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to OFF.

**2. COMPONENT DESCRIPTION**

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic control throttle relay
- (5) Motor

**3. ENABLE CONDITION**

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF

**4. GENERAL DRIVING CYCLE**

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

**5. DIAGNOSTIC METHOD**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5$ V

**Time Needed for Diagnosis:**

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

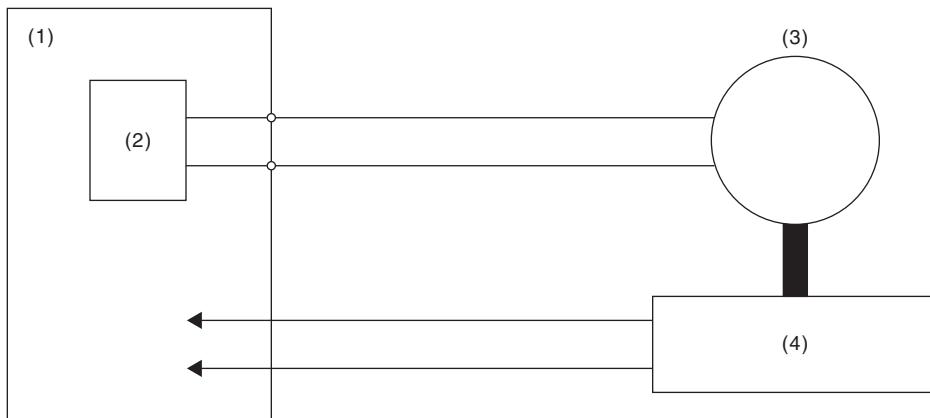
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DS:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot be conducted or an abnormal value is detected.

### 2. COMPONENT DESCRIPTION



EN-01869

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

**Time Needed for Diagnosis:** None

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

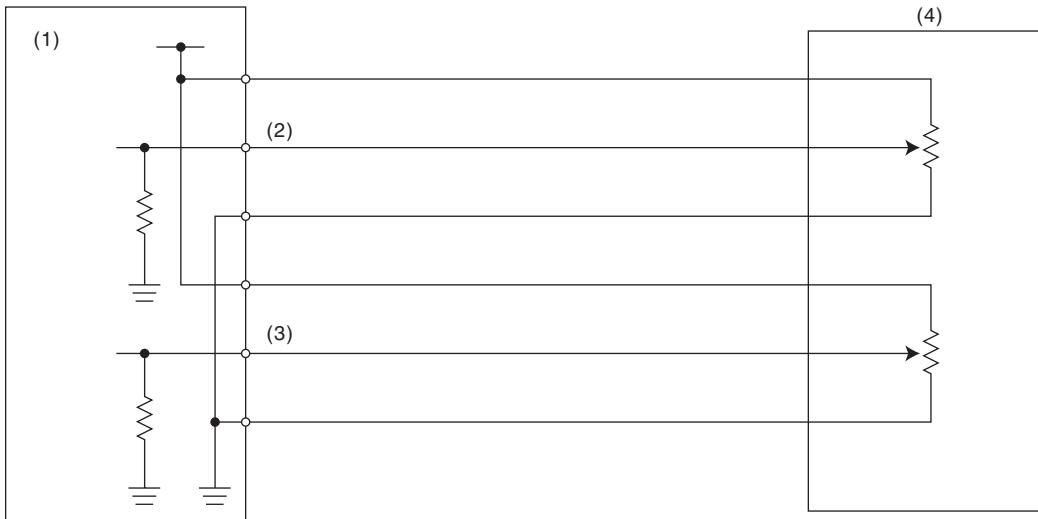
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DT:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\geq 0.308$ V

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

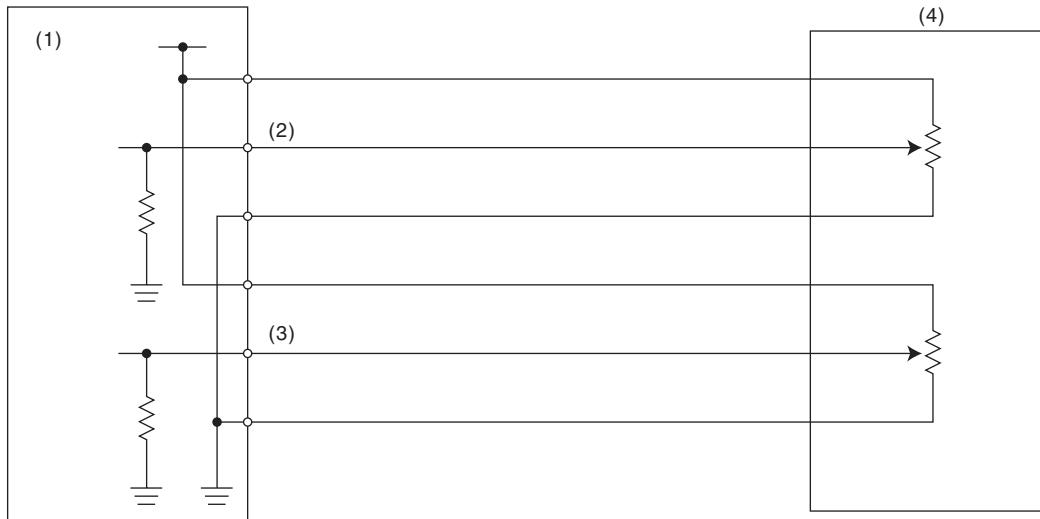
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DU:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\leq 4.856$ V

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

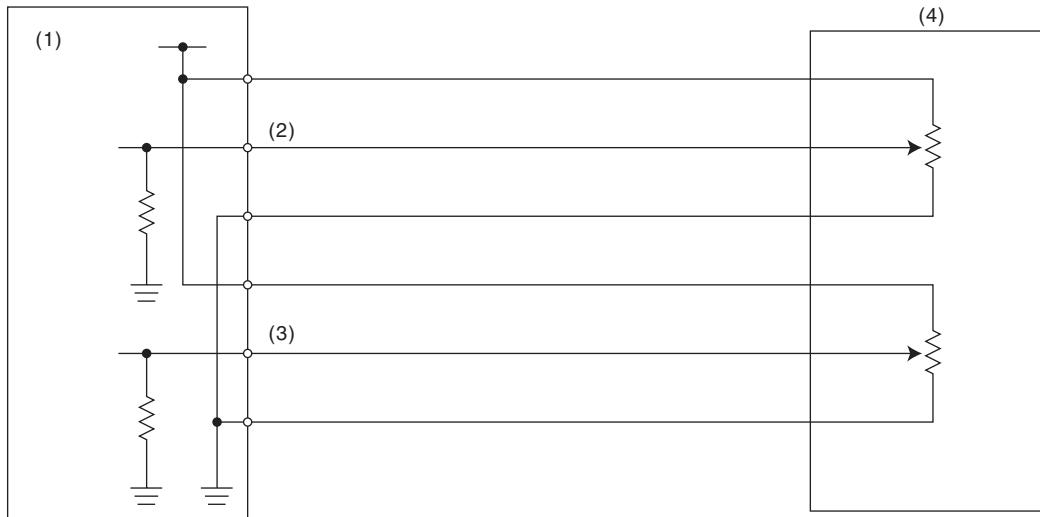
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DV:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\geq 0.308$ V

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

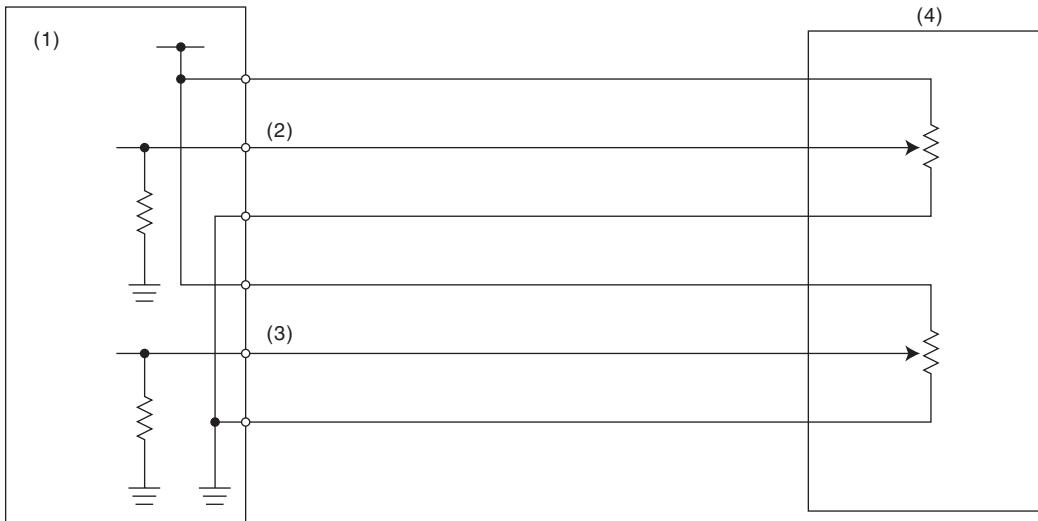
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DW:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\geq 0.308$ V

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

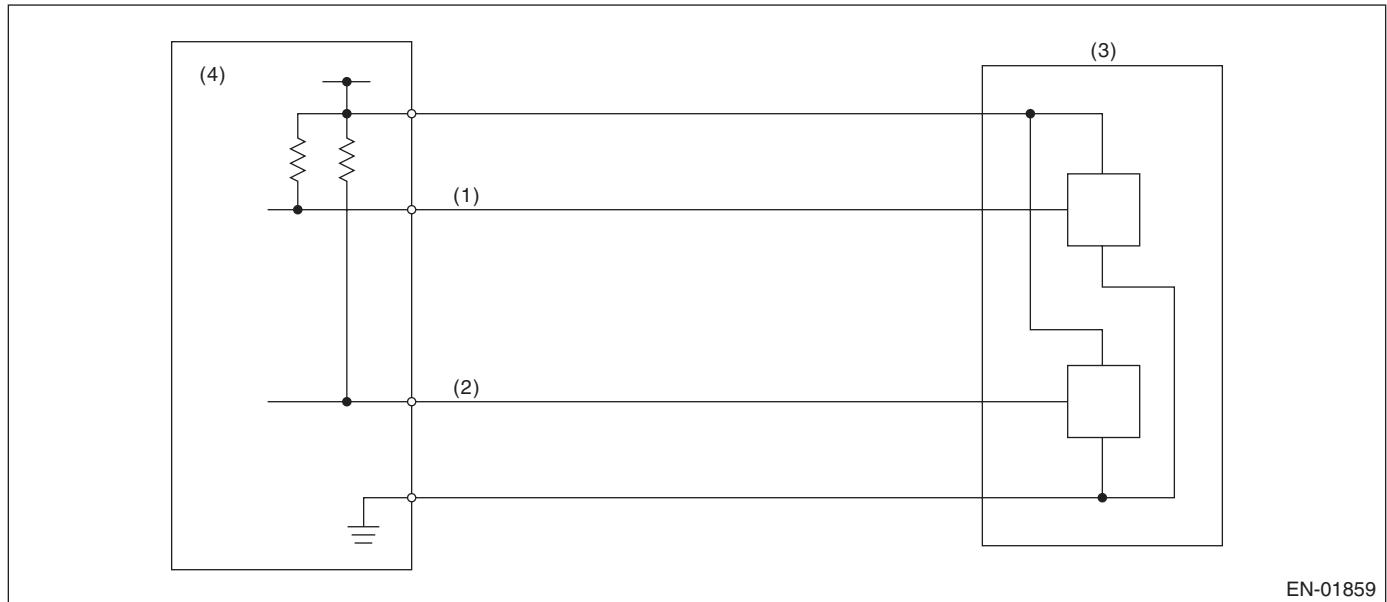
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DX:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal.
- (2) Throttle position sensor 2 signal.
- (3) Throttle position sensor
- (4) Engine control module (ECM)

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

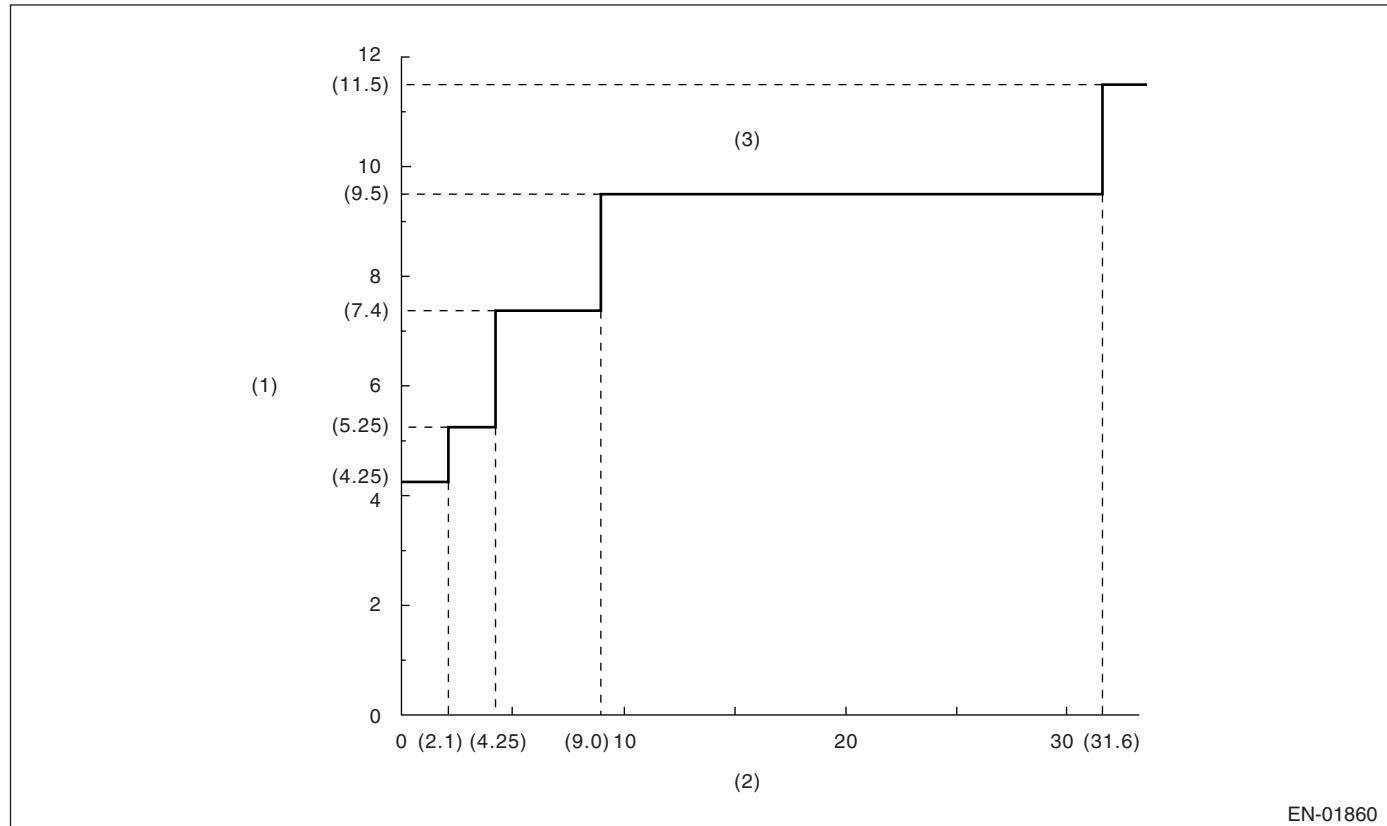
#### Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 4.25$

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Details of Judgment Value



(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

**Time Needed for Diagnosis:** 212 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

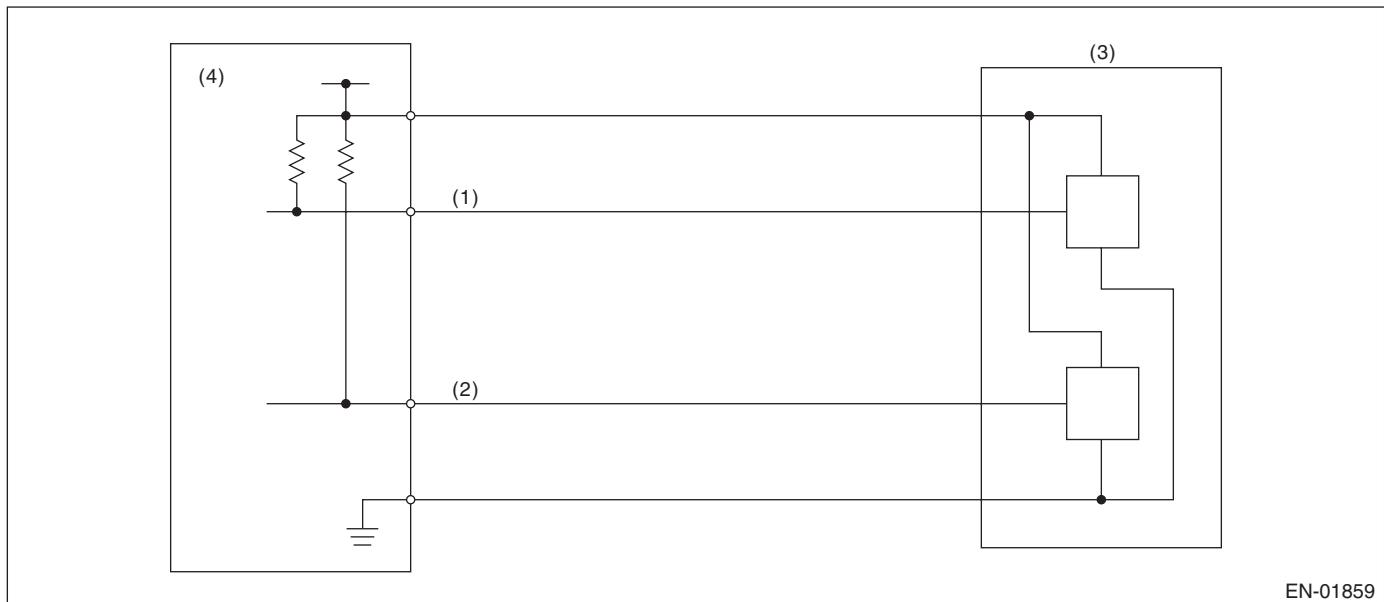
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DY:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

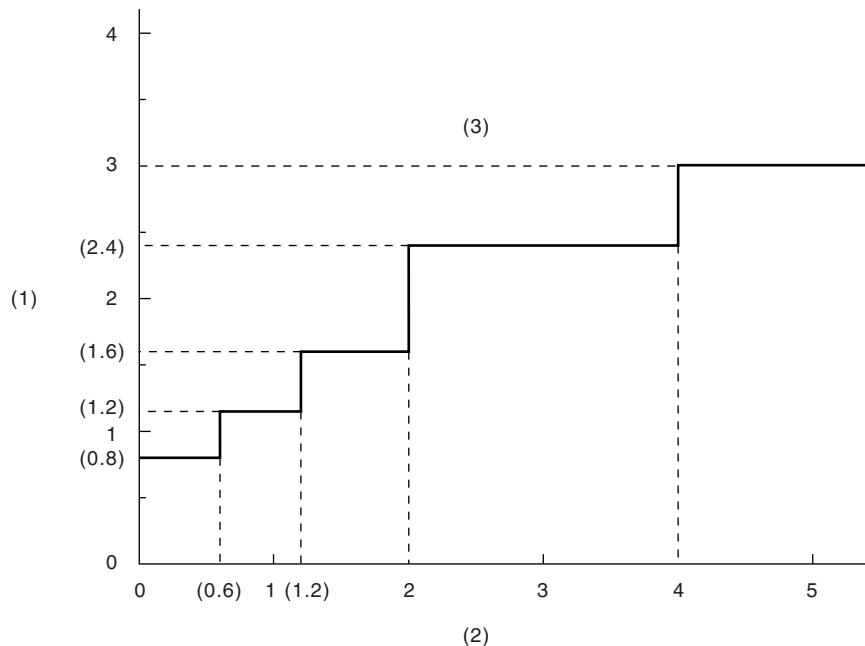
#### Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.8^\circ$

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Details of Judgment Value



EN-01870

- (1) Sensor output difference (°)
- (2) Accelerator pedal position sensor 2 opening angle (°)
- (3) NG area

#### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 8. FAIL SAFE

Fix the throttle opening angle to 6°.

#### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## DZ:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for atmospheric pressure sensor property	Not finished

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
$ \text{Atmospheric} - \text{manifold absolute pressure} $	$\geq 26.7 \text{ kPa (200 mmHg, 7.88 inHg)}$
$ \text{Intake manifold pressure at engine starting} - \text{manifold absolute pressure} $	$< 1.33 \text{ kPa (10 mmHg, 2.95 inHg)}$

**Time Needed for Diagnosis:** 0.3 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	$< 26.7 \text{ kPa (200 mmHg, 7.88 inHg)}$

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### EA:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## EB:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	$\geq 4.936$ V

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	$< 4.936$ V

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# **Diagnostic Trouble Code (DTC) Detecting Criteria**

## **GENERAL DESCRIPTION**

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